

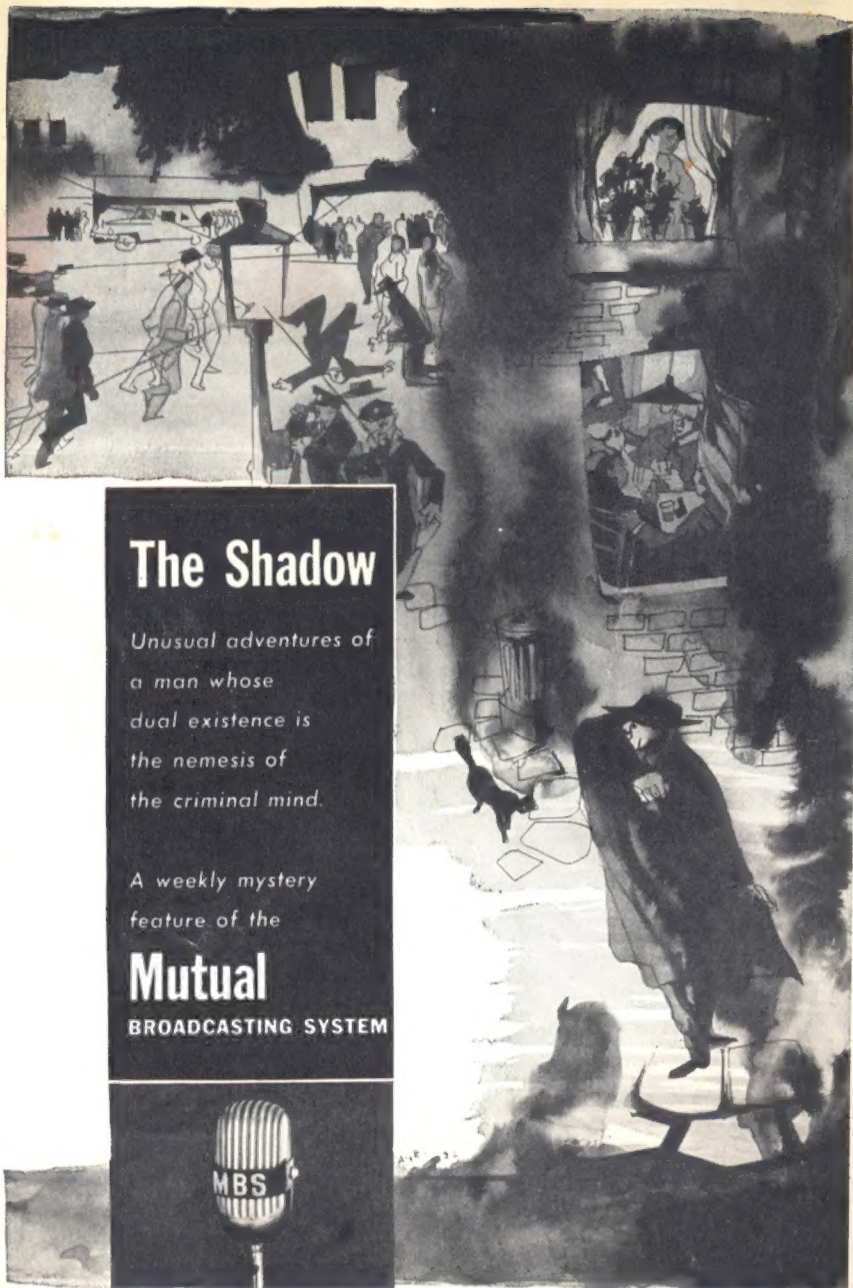
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The Gulf Between BY TOM GODWIN





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Astounding SCIENCE FICTION

VOLUME LII • NUMBER 2

October 1953

Short Novel

The Gulf Between Tom Godwin 8

Novelette

Belief Isaac Asimov 71

Short Stories

The Test Ralph Williams 57

The Scavengers James White 121

Articles

Filming "War Of The Worlds" George Pal 100

How To Talk To A Martian G. R. Shipman 112

Readers' Departments

The Editor's Page 6

In Times To Come 141

The Reference Library P. Schuyler Miller 142

Brass Tacks. 152

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UNWISE KNOWLEDGE

"The more you study, the more you learn. The more you learn, the more you forget. The more you forget, the less you know . . . so why study?" Old school-boy conundrum.

At some time during his school career, I think every kid is exposed to that one. It wouldn't have lasted down the ages so well if it hadn't had a deep basic fragment of truth in it, and there seems to be indications that it was translated into Ancient Greek from More Ancient Egyptian.

There is very real truth in it—and it's the very real dilemma now facing our world, at the cultural level instead of merely at the individual level. It is fairly easy to show that *more knowledge* can yield *less wisdom*.

One of the easiest ways to consider the problem is to put it in terms of a library. This library is a little peculiar in that the librarian has figured out only one way of arranging the books in an orderly fashion; all the books are arranged in order of their mass in grams. The cataloguing of books on this basis is a little clumsy for the individual seeking specific information, of course. If you want specific information on the solar planets, you may find the necessary book between

"How To Train Performing Fleas" and "Shakespeare's Tragedies." It won't be too much of a task if the library has only about two hundred books.

But if we return ten years later, when the library has grown to fifty thousand volumes . . . You know, the acquisition of all that additional information has made the original two hundred books *less* useful?

Some while back I ran an editorial on the proposition that pure noise contained all possible information; the reverse can be made equally true. If all the information Man has is recorded on magnetic tape, for example, and all the tapes are played simultaneously through a single loudspeaker, we would have pure noise as the output.

Suppose we decided to speed up education by putting students in the center of an octagonal classroom, and have eight lecturers deliver eight simultaneous lectures on Basic Inorganic Chemistry, Physics, American History, Freshman Biology, English, Social Science, Economics and Geometry.

It's evidently necessary to have information separated sufficiently to allow usefulness. Anyone who's

worked with a length of Scotch Tape knows the rapidity with which it can render itself useless by getting together with itself.

Pure data is useless. Suppose you receive the true and valid datum "One two-hundredth grain is an appropriate quantity of nitroglycerine." A more useless bit of information is hard to imagine; it would become valuable *only* if you knew the nature of nitroglycerine, and that the "appropriate" above referred to "appropriate in treating an angina patient." *Not* appropriate for snuffing out an oil-well fire, or for making a stick of dynamite for mining operations.

Only *data-and-relationship* has value. But if the data-and-relationship system is diluted with unrelated data, the total resultant is less useful than the lesser quantity of data-and-relationship alone.

The sheer accumulation of data, data, and more data, then leads to a gradual loss of effectiveness; unrelated data injected into any system of related data is perfectly equivalent to injecting noise into a message—or holding eight simultaneous lectures in one room.

Data without relationship is useless. Obviously, relationship without data isn't very useful either. "A piece of germanium containing certain quantities of certain impurities, treated in certain processes, will yield a device capable of amplifying electronic signals to a certain degree, with a certain

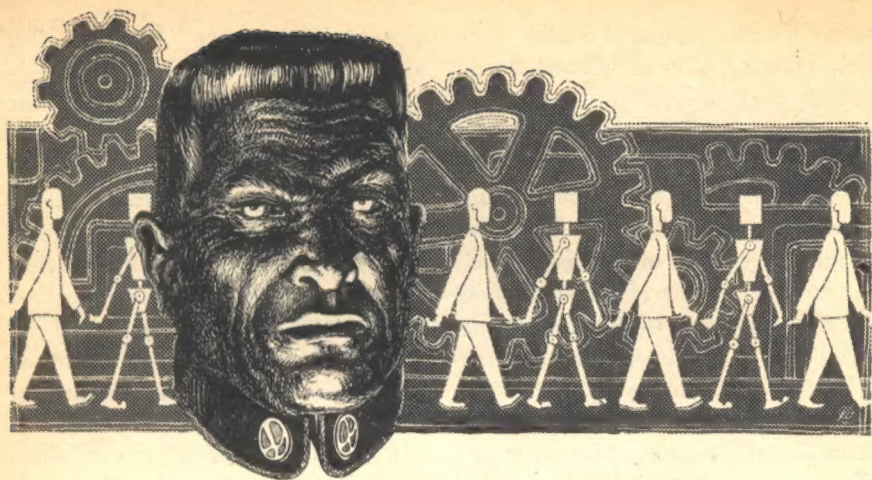
signal-to-noise ratio." That's a fine statement of relationship. It'll be useful when we can specify the data that the statement relates.

At the present time, our culture is accumulating data at a fearful rate—but it isn't relating the data very well. The information is accumulating mountainously—but the Library of the Culture has not developed an adequate cataloguing system, so that the information the culture already has is rapidly decreasing in value.

Example: The social sciences—sociology, anthropology, psychology—are all accumulating data in vast profusion. Each of these groups particularly claims that they are young sciences, and need more time to gather information.

Meanwhile the physical sciences, which early worked out very useful cataloguing systems, have made great progress at the practical-application level—but haven't related physical progress with social progress. As things now stand, additional practical application data of physics is in danger of becoming of negative value—it's so unrelated to the culture that more adequate data on hydrogen fusion reactions, self-guiding missile equipments, and the like are tending to constitute information having *negative* value to the culture. Further improvement in the physical sciences may yield a simple method for transmuting elements, and even a method

Continued on page 160



THE GULF BETWEEN

BY TOM GODWIN

There was a man who hated men because they would not obey him like robots. Then he got a robot . . .

Illustrated by Kelly Freas

He was dying!

The fear flooded over him again, dark and smothering and made worse by his inability to move. His doctor was standing near him, watching over him with dark, patient eyes, knowing that he was dying. When a man is dying, there should be comfort in the presence of a doctor who knows how to save his life. His doctor knew he was dying and had already done the thing that should have saved him from death; the doctor had informed the pilot of his condition by

means of the letters on the pilot's communications panel. They had leered at him for an endless eternity: OBSERVER DYING OF EFFECTS OF FULL ACCELERATION. IMMEDIATE REDUCTION OF ACCELERATION IS SUGGESTED.

His doctor watched him die with dark, brooding eyes and suggested to the pilot that the acceleration be reduced.

But the pilot's seat was empty.

He was the pilot, and the doctor knew it . . .

Lieutenant Knight flattened himself behind the outcropping on the windswept ridge and raised his head to stare across the small basin at Hill 23, looming red-scarred and forbidding in the Korean rain; deceptively, ominously quiet, as though daring Company C to resume its vain battering at it.

"Don't look dangerous, does it?" Sergeant Wenden asked, his bush of black and gray beard close to the ground as he crawled up beside Knight. "Real calm and peaceful. Good old Hill Twenty-three — all we gotta do is take it."

The blue of the Pacific gleamed beyond Hill 23; if they could take the hill it would destroy one of the last remnants of one of the last Russian beachheads on the Korean coast. It would not be difficult — if Cullin would only wait another day until Company B came up.

"I have an idea they won't want to give that hill up," the sergeant went on. "It's their last one; their backs are to the sea and they're goin' to argue about givin' it up."

Knight did not answer, studying the terrain of the hill and the basin that lay between; planning the best route for the Fourth Platoon, the best way to give them a fighting chance.

"Yep, real calm and peaceful," the loquacious sergeant repeated. "I wonder if their snipers know we're lookin' over the ridge at 'em?"

His answer came a half second later;

a spurt of rock dust as a bullet struck between them, and a shrill scream as it ricocheted away.

"Reckon they do," he grunted, dropping his whiskers low and scuttling backward from the crest of the ridge. Knight followed, and they slid to the bottom of the small gulch that ran behind the ridge.

"Of course," the talkative sergeant remarked philosophically, biting off a chew of tobacco, "bullets'll be snappin' all around us in another hour, but there ain't no reason to invite one of 'em to hit us any sooner than it has to."

Knight started back down the muddy gulch and the sergeant tramped beside him, paying no attention to his silence. "The Chinese and Rooshans are about ready to call this war a draw, I hear. Except for Korea, here, neither us nor them is makin' any headway and they say the chances of an armistice is real good. I hope so; I've had all the war I want and I've already got it figgered out how I'm gonna settle down in Florida and raise chickens — or somethin'. Wish they'd declare the armistice right now — they're dug in on that hill and the Fourth is goin' to have one hell of a time tryin' to be the decoy and draw their fire and not all of us get killed." He scowled at Knight, his philosophical attitude turning to wrath. "A lot of men are goin' to die real soon, and for no reason. Company B will be up tonight — why can't we

wait till tomorrow?"

Knight shrugged. "Orders."

"Yeah — orders!" The sergeant snorted disgustedly. "Our Captain Cullin wants *his* company to take that hill *today*, then he can tell battalion headquarters to not bother about sendin' up any support, that he done took the hill all by himself. Then, he figgers, regimental headquarters will be so impressed by his ability to do so much with so few men that they'll recommend he be raised to major. And *then*" — the sergeant spat viciously — "he'll have a whole battalion to give orders to, 'stead of only a company!"

Knight half heard the sergeant as they walked along, his thoughts occupied with the suicidal role his men would have to play. They would be the decoy, as the sergeant had said, deliberately and perhaps fatally drawing the concentration of enemy fire upon themselves.

"... I'm a Regular Army man," the sergeant was saying. "I've been in this game for thirty years, but I ain't never seen an officer like Cullin. All he thinks about is himself and his own glory. He made it plain to us what he was when he took over this company. 'A soldier is only as good as his ability to obey orders,' he says. 'You men are going to *be* soldiers,' he says, 'and there will be no questioning of any order given you. I want, and I shall have, absolute obedience and discipline,' he says —"

Decoy.

It would be senseless, needless slaughter of the Fourth Platoon. It would enable the rest of the company to take the hill but the premature attack was not necessary; the enemy had their backs to the Pacific and they could retreat no farther. They could retreat no farther and they certainly would not dare attack.

Why had Cullin chosen the Fourth Platoon as the decoy? Was it because of the hatred between himself and Cullin? The Fourth was *his* platoon; by sending it on a suicide mission Cullin could add the savor of revenge to the sweet taste of glory.

The Fourth was his platoon, and between himself and the men of the Fourth was the bond that months of common danger had welded; the bond of brothers-in-arms that is sometimes greater than that of brothers-by-blood. They did not give his gold second-lieutenant's bars any parade-ground respectful salutes; instead, they respected him as a man, as Blacky who slogged through the mud and rain beside them, who ate the rations they ate, who knew their names and moods, who was one with the hard veterans of combat and the nervous young replacements. Not Lieutenant Knight; just Blacky, to whom someone would sometimes come on the eve of battle and say: "This address here — it's Mary's. If I'm not so lucky this time, I wish you would write her a few words. Just tell her I wanted to see her

again but that I . . . well, just say that I said . . . that I said — Aw, hell, Blacky — you'll know what to say."

He would sit by the light of a gasoline lantern in the nights following the battle and write the letters; not alone for the one who had asked him to but for all who had been "not so lucky." They were hard to write, those letters. Soon, now, if he, himself, were not among those not so lucky, he would have more of them to write — far more than ever before.

" . . . What would you say caused it, Blacky?" the sergeant was asking.

"What?" Knight brought his mind back to the present. "How was that?"

"I say, you take a man like Cullin — what do you reckon makes him act that way? You oughta know — you knowed him when you was both kids, didn't you?"

"I've known him most of my life, from the time we were each six years old," Knight answered. "He was always a lot like he is now — even as a kid he wanted to boss the other kids and make them do things for him. I don't know why he hasn't matured emotionally as well as physically. A psychiatrist might be able to trace it back to something — I'm a computer engineer, misplaced in the infantry, and not a psychiatrist."

"Well, if I was one of these psychiatrists, I'd sure ask him if he didn't once have a set of wooden soldiers he liked to play with better than any-

thing else. That's the kind of soldiers he wants us all to be — wooden dummies that don't dare move unless he says to."

They came to the mouth of the gulch and Knight stopped beside a splintered tree. "I have to go over to where he has his headquarters for a last-minute briefing," he told the sergeant. "It's a little over an hour, yet, so everybody might as well take it easy till then. I'll be along in a few minutes."

The sergeant craned his neck to stare past Knight with sudden and baleful interest. "Here he comes now, down from the Second. Guess he's makin' the rounds personally this time." He scowled at the approaching captain then hurried away, his course such that only his long, fast steps prevented a face-to-face meeting.

Knight waited beside the tree and Captain Cullin strode up to him; a big man, heavier than Knight and almost as tall, with an arrogant impatience to the arch of his nose and a relentless drive in the set of his thick jaw and the iciness of his eyes.

He stopped before Knight, with a glance after the rapidly disappearing sergeant, and said acidly: "If the men in my company could be relied upon to display as much determination when sent on a mission as your sergeant just now displayed to avoid saluting me, I would think I had a first-class combat unit."

"He's a good man — none better," Knight said. "He just didn't happen to feel like going in for any such melodrama as: 'We, who are about to die, salute you!'"

"Very witty," Cullin said coldly. "Although your wit, in its implications, is rather melodramatic, itself. But suppose we talk of something a little more important — the action of your platoon in taking that hill. I've moved the attack up half an hour. The other platoons are already taking up positions as advanced as possible until your own platoon draws the enemy fire."

"I just came down from off the ridge," Knight said. "I know the lay of the land and I have your orders as given to me by Lieutenant Nayland; to attack as best we can along the southwestern floor of the hill and keep the enemy occupied while the other three platoons close in on their flanks. But the strategy is your own, so I'm listening if you have anything to add. From you, I get the dope straight from the horse's mouth."

Cullin stared at Knight, hard lines running along his jaw and the hatred burning deep back in his eyes.

"I want to remind you, Knight," he said at last, "that you are my subordinate officer. An officer's promotions are usually in direct ratio to his ability, and we received our second-lieutenant's bars at the same time — remember? I'm a captain, now, in command of a company; you're still

a second lieutenant in charge of a platoon. I'm your commanding officer and you keep that fact in mind at all times. You will restrain your wit, confine yourself to obeying orders and extend me the same courtesy I demand of my other platoon leaders. Is that clear?"

"Very clear," Knight replied. "Your orders have been, and will be, obeyed. When in the presence of others I'll continue to observe every rule of military courtesy, as I have in the past. But I've known you too long and too well to have any desire to go through those antics when you and I are alone."

"Discipline is not an antic, Knight. The purpose of discipline is to condition the soldier into efficient obedience. You will obey me with full military courtesy and you will not presume an equality with me because of our past friendship."

"Our past friendship is a long way past, and I'm sure neither of us has any desire to ever renew it. I would like to ask you a question, though — why do we attack today when Company B will be up tonight?"

"For a very good reason — because I've ordered it," Cullin said flatly.

"That's all?" Knight asked.

"That's sufficient. It isn't required of you to seek any other reason."

"'Theirs not to reason why—' . . . that's what you want, isn't it?"

"That's what I intend to have."

"By waiting for B's support you

might not win any major's oak leaves but you would save a lot of lives. There's no hurry about taking that hill—those Reds aren't going anywhere."

"Keep your advice to yourself, Knight. Casualties are to be expected in any combat unit and this company will remain a combat unit as long as I am in command of it."

"Then give me your orders," Knight said with brittle resignation. "I'll see that they're followed, regardless of what I think of them."

"See that you do. This is what I want out of your platoon, and I won't tolerate any deviation from these orders—"

How long had he been a living brain in a dying husk of a body? Had it been weeks or months or years, and how much longer could it continue? If only he could forget the end that was drawing irresistibly closer; if only his mind could lose its clear perception and go into the comforting solace of unknowing insanity!

But the doctor would not let it; the doctor watched him and injected the antihysteria drug into his bloodstream whenever madness threatened to relieve his mind of its cold and terrible knowledge. Sanity was a torture in which his body sat helpless and immobile while his mind perceived with clear and awful detail and recoiled and whimpered in futile, desperate fear from what it perceived.

Yet, the doctor didn't want to torture him; the doctor didn't want him to die. The doctor was using every means known to medical science to prolong his life. But why did the doctor merely prolong his life when his life could be saved entirely with less effort? There was still time—the doctor had only to do as he had suggested the phantom pilot do; reduce the acceleration. The deceleration button was visible on the control board in front of the vacant pilot's chair. The doctor didn't really want him to die, and the doctor could save his life by one quick flick of the deceleration button.

WHY DIDN'T THE DOCTOR DO IT?

Peace.

Four years of peace, with all their changing of the ways of his life, were to pass from the time Knight stood beside a splintered tree in Korea and heard his last orders until he met Cullin again.

First, there had been the bullet-swept hell of the attack on Hill 23 and then a long time in the hospitals—field hospital, base hospital, State-side hospital. There had been the irony of the cease-fire order two days after the slaughter of the Fourth Platoon. There had been the letters to write, so many of them and so many lies to tell. The folks at home always wanted the comfort of knowing that their Tommy or Bill or Dave had found death to be not cruel and merciless but something that had come quickly and painlessly, for all its grim finality.

There had been the day of his discharge from service and the strange feel of civilian clothes. There had been a period of restlessness, a period during which the peacetime world seemed a shallow and insignificant thing and the memory of the Fourth was strong within him as something irretrievably lost; a comradeship forged by war and never to be found again in the gentle fires of peace.

Then he had received the letter from Computer Research Center, and the invitation to come to Arizona and work with Dr. Clarke, himself. Clarke had written: ". . . The theory you set forth in your thesis can, I think, be worked out here at Computer Research Center and an experimental model of such a 'brain' constructed. I asked for your assistance eighteen months ago, but our little semimilitary Center lacked the influence to have a combat officer recalled from active duty—"

His theory had been valid, and Computer Research Center was no longer small and unimportant. The Knight-Clarke Master Computer was a reality and Center had become the most powerful factor in the western hemisphere. The restlessness had faded away as he adjusted himself to taking up his old way of life and he forgot the war in the fascination of creating something from metal and plastic that was, in a way, alive.

In four years he had found his place in life again and the ghosts of

the Fourth lay dormant in his mind; splendid and glorious in the way they had fought and died but no longer stirring the restlessness and the sense of something lost.

Then he met Cullin again.

Punta Azul was a cluster of adobes drowsing on the northeastern shore of the Gulf of California, away from the tourist routes and accessible only by a long and rough desert road. Nothing ever happened in Punta Azul; it was a good place for a man to rest, to fish, to sit in the cool adobe cantina and exchange bits of philosophy with its proprietor, Carlos Hernandez.

And it was a good place to do a little amateur-detective checking on a suspicion.

It was siesta time and everyone in Punta Azul was observing that tradition but Knight and Carlos—and even their own conversation had dwindled off into silence. Knight was nursing a glass of beer, putting off the time when he would have to leave the cool cantina and drive the long, hot miles back to the border, while Carlos was at the other end of the bar, idly polishing his ceraveza glasses and singing in a soft voice:

"Yo soy la paloma errante—"

He was a big man, with a fierce black mustache that made him resemble Pancho Villa of old. He sang softly, in a clear, sweet tenor. Why, Knight wondered, do so many big

men sing tenor and so many small men sing baritone?

"*El nido triste donde naci*—" Knight listened, unconsciously making a mental translation of the words into English:

*I am the wandering dove that seeks
The sad nest where I was born—*

How old was "La Paloma"? Music, like men, had to possess more than a superficial worth to be remembered. Novelty tunes and bebop, like the little Caesars and Napoleons, lived their brief span and were forgotten while the music that appealed to the hearts of men never died. People had a habit of remembering the things that appealed to them and finally forgetting the others.

Once there had been a man named Benedict Arnold. No living person had ever seen him; they knew him only from the books of history. At one time he had been hated but no one bothered, any more, to hate him. He was no longer of interest or importance to anyone.

And once there had been another man that no living person had ever seen. Like Benedict Arnold, he was known to them only through the books of history. But he had appealed to something in other men, so they had built a monument in his honor and there he sat carved in stone, tall and gaunt. The sculptor had been a master, and the things about the figure that appealed to other men were in his face; the understanding and the

gentle compassion. People came to look at him, the loud of mouth suddenly still and the hard of face softening. They looked up at him with their heads bared and spoke in quiet voices as though they stood before something greater than they.

Yet, Lincoln had been only a man—

His musing was broken by the sound of a car in the street outside, stopping before the cantina. Its door slammed and a man stepped through the open doorway of the cantina; through it and then quickly to one side so that he would not be outlined against the light as he took his first look at the interior. He was, Knight noticed, wearing a white sports coat and his right hand was in the pocket of it. His identity registered on Knight's mind almost simultaneously and he tensed as a cat might tense at the sight of a dog.

It was Cullin.

Then he relaxed, and waited. Once there had been a time when he might have killed Cullin, when the memory of the vain sacrifice of the Fourth might have brought the hate surging red and unreasoning to his mind. But four years had altered his emotions. The hatred had settled into something cold and deep and not to be satisfied with brief physical violence. It was cold and deep and patient, and there are better ways than physical violence of finding vengeance if one is patient.

Cullin's eyes flashed over Carlos, still polishing his ceraveza glasses, and

up the length of the bar. He stiffened at the sight of Knight and there was a slight movement of his right hand inside his coat pocket. For perhaps ten seconds neither spoke nor moved; Knight sitting on the high stool, half turned away from the bar with his glass still in his hand and Cullin looming white-coated just within the doorway, alert and waiting for Knight to make a hostile move.

Knight broke the silence. "Going somewhere, Cullin?"

Cullin walked toward him, warily. "So we meet again?" He seated himself on a stool near Knight, facing him with his hand never leaving his pocket.

Carlos started toward them, looking questioningly at Cullin, and Cullin motioned him back with a wave of his left hand and a curt, "*Nada!*"

Carlos returned to his glass polishing and Cullin looked curiously at Knight. "It's a small world, Knight—sometimes too small. What are you doing here, anyway?"

"I could ask the same of you."

Cullin made no answer and Knight went on: "I see you're a civilian again. The last time I saw you, you were flicking the dust off your handkerchief in anticipation of polishing a pair of gold oak leaves."

"Peacetime armies and ambitious officers aren't compatible," Cullin said, his jaw tightening at the words. "This is especially true if you aren't

a Regular Army officer."

"I heard that you never did get those oak leaves; that you got a bawling-out, instead, and a demotion back to second lieutenant. It seems they had something to say to you about 'stupid and unnecessary sacrifice of men.'"

Cullin's face flushed a dull red. "A bunch of sentimental old women. My strategy was sound; I took the hill."

"Yes, you did—didn't we?" Knight agreed, smiling without humor.

"As commanding officer, I would have been stupid to have done anything as vainglorious as to actively engage in the fighting. You should know that. Leaders are not dispensable, while the led are."

"Anyway, you've now forsaken the military career?"

"I've found myself a new field where my abilities are duly appreciated and rewarded."

Cullin volunteered no further information and Knight decided it would gain him nothing to ask. Nor would needling Cullin cause him to reveal the reasons for his presence in Punta Azul; a roundabout and non-hostile approach would be better.

"I ran across an item in the paper three years ago," he remarked to Cullin. "According to it, you had missed a curve and plunged off into the Feather River canyon."

"My car went over the cliff and into the river. The papers erroneously assumed I had been in it when it left



the road. I never did correct them."

"Why didn't you?"

"Why should I?"

"No particular reason to do, I suppose," Knight agreed.

Cullin studied Knight with a calculating look in his eyes, then said in a tone almost friendly, "Obscurity hasn't been your own lot, Knight. The papers are full of the things being done by the Knight-Clarke Computer. They claim it can outthink a thousand men."

Knight kept his face expressionless. He, Knight, wasn't the only one who wanted information; there was something about the Computer that Cullin wanted to know.

"Its knowledge is greater than that of a thousand men," Knight replied, adopting Cullin's own attitude of

pseudo-friendliness. "Of course, among a thousand men much of the knowledge they possessed would be common to all of them. The Computer is valuable in that it can combine and correlate the specific knowledge of men in all the different fields of learning."

"I was especially interested in one article. As *the Knight of the Knight-Clarke Computer*, perhaps you can give me the true facts."

"Which article was that?" Knight asked, then failed to resist the impulse to add, "From me, you get the dope straight from the horse's mouth."

Cullin's face flushed again and the knots of muscle stood out along his jaw. It was with an obvious effort that he forced his voice to retain its conversational tone. "This article came

up with the proposition that the Master Computer, with all its knowledge and its ability to devise weapons, could rule the world if it only had a means for manual operations, such as tentacles or hands, and if it had a means of locomotion instead of being bolted to a concrete floor."

"Why should it want to rule the world?" Knight asked.

"The article claimed that it would have absorbed men's motivations along with their knowledge, and it further claimed that no one thousand men can be found who are utterly free of the desire for power over others."

"I read the same article," Knight said, smiling a little. "The writer, as is true of all writers for that particular 'news' weekly, was following the editorial injunction to make it interesting, and never mind the facts. I'm surprised that you were gullible enough to believe it."

"I wasn't gullible enough to believe it. I just wondered if there was any truth at all to it and, if so, why couldn't that characteristic be utilized. You might, say, build such a brain into a tank and use a perfect soldier as its source of knowledge; a soldier who knew tank warfare from A to Z and who fanatically desired to kill as many of the enemy as possible."

"No." Knight shook his head. "The robotic brains don't absorb emotions along with the knowledge. Emotions aren't facts, you know; they're the creation of a sensory

body and the nerves and glands that affect that body. We haven't worried about the Computer's lack of emotions—it doesn't need them to accept the data we give it, correlate that data and give us the answer we want.

"But so far as tanks controlled by robotic brains go," he added, "we have one in the experimental stage at Center, now."

"Oh?" Cullin's surprise seemed simulated. "I thought you just inferred they weren't possible?"

"Possible, but not too practical at the present stage. For best results, the robotic brain has to be in close communication with an ordinary flesh-and-blood soldier."

Cullin's surprise became genuine. "You mean your robotic brains aren't thinking units at all, but just a conglomeration of television and radar, operated by remote control?"

"No—the brains can comprehend and obey the most complex orders."

"Then why do you say they aren't practical?" Cullin demanded. "So long as they comprehend and obey, nothing more is needed. What more could you want?"

"The human element—initiative and curiosity."

Cullin's lip curled. "'The human element!' You were never able to understand the military, Knight. The 'human element' is precisely the thing a good commander tries to weed out among his men. Initiative contrary to given orders cannot be tolerated, nei-

ther can questioning of those orders be tolerated. In your robotic brain you have the brain of a perfect soldier. It would need only one more thing, and I suppose it has that—an utter lack of fear.”

“It has no conception of any such emotion as fear.”

“A complete lack of fear, an intelligence great enough to understand the orders given it, and unquestioning obedience in following those orders—those are the three characteristics of the perfect soldier, Knight.”

Knight shrugged. “A matter of opinion. You’re presuming a machine’s actions would be the same as a man’s actions.”

“They *are* the same. I’ve found that humans serve in exactly the same manner as machines. There is no difference, once the human has been conditioned into obedience.”

Knight switched the subject abruptly, feeling that the talk of Center was not going far enough toward causing Cullin to reveal his business in Punta Azul. “I see that Premier Dovorski is doing a good job of applying that philosophy to the Russo-Asians,” he remarked. “He’s *really* making robots out of the people.”

“So I’ve heard,” Cullin said, making no other comment but his eyes suddenly more watchful.

“I suppose there will be war again within ten years.” Knight idly swirled

the beer in his glass. “We’ll be outnumbered four to one, but maybe we can have the Computer give us something that will even the odds.”

Cullin hesitated, then said: “I hear rumors that you have both a spaceship and a disintegrator ray on the drawing board. The disintegrator ray should even the odds, if it’s as good as the rumors say. Of course, I suppose these rumors usually exaggerate the true facts?”

“I suppose.” Knight ignored the question. “Sometimes we deliberately create rumors to throw Dovorski’s spies off on false leads, too. One was caught in Center yesterday. He made the mistake of trying to shoot it out with the Center police, but he lived long enough to talk a little.”

Suspicion blazed in Cullin’s eyes, and there was menace in the way he silently waited for Knight to continue.

“We didn’t think he would know the identity of the head of the Russo-Asian spy ring, but we asked him, anyway,” Knight said, still swirling his beer.

Cullin stared at him and waited, as a rattlesnake might wait, poised to strike. The bulge of his hand in his coat pocket showed that his finger was on the trigger and Knight could hear the sound of his own breathing in the silence. A fly droned loudly across the room and out the door, while Carlos’ low humming made an incongruously melodious back-

ground to the deadly tension.

He ceased swirling the beer in his glass and looked Cullin full in the eyes, grinning mockingly at him.

"He gave us a name, Cullin."

"So you were leading me on?" Cullin hissed. "You've just written out your own death warrant—fool! You're going with me!"

"And espionage is the new field where your abilities are appreciated and rewarded?" Knight shook his head with feigned sympathy. "You really had no reason to give yourself away. I came down here on a suspicion of 'fishermen' who hire boats from the Mexicans at regular intervals. I wouldn't have connected you with it if you hadn't been so curious about the Computer, and then naïve enough to fall into my crude little trap. I told you the spy gave us a name—he did. He told us his own name, then he died."

"I'm afraid your cleverness has backfired on you, Knight, but enjoy it while you can. You can go to the beach with me and prolong your life for a little while, or you can take it here and now—*which?*"

"I'm not too fond of the idea of taking it either place, but I wouldn't want to mess up Carlos' floor." Knight swirled the warm beer again and held it up to the light. "Flat. The Greeks had an expression for everything, didn't they?" he asked, smiling, then said something swiftly in a foreign tongue.

Cullin reacted as quickly as a cat, the pistol out of his pocket and hard against Knight's stomach, his head jerking around to watch Carlos.

Carlos was still polishing his cervesa glasses, his back turned to them and his humming continuing unbroken.

Cullin turned back to Knight. "That didn't sound like Greek to me. If your friend tries anything, you know where you'll get it."

"You would prefer to not arouse the village by doing any shooting in here, wouldn't you?" Knight asked. "These Mexicans might not like the idea of a stranger shooting up their town."

"I'm not worried about these sleepy Mexicans. And I've changed my mind about killing you—if you co-operate with me. Tell me all the things I want to know, and I'll let you go free."

"Under such circumstances, the gun in your hand is no threat," Knight pointed out. "Dead, I can't answer your questions. Alive, why should I?"

"Alive and not answering my questions, you are of no value to me," Cullin said grimly. "I came here to hire a boat to take me to a certain place several miles down the beach where a submarine will pick me up. This was both my first and last trip down here. I can get by without hiring a boat—I have a truck with a four-wheel drive and oversize tires for sand. I can kill you and be in it and

gone before these Mexicans wake up, and they could never follow me through that sand in your own pickup.

"So—you can go with me and be released after you answer our questions on the submarine or you can refuse and I'll let you have it now, with nothing to lose."

"I'm pretty sure that my release from the submarine would be over the side of it with my hands tied behind my back and a weight tied to my neck, Cullin. That's why I quoted the pseudo-Greek phrase. I have a Papago boy working in my department at Center, and Carlos' mother was a Papago. Have you noticed him lately?"

Cullin turned his head quickly, but the muzzle of his pistol remained shoved hard against Knight's stomach.

Carlos was still humming, but he was no longer polishing glasses. One elbow was leaning on the bar and in the hand of that arm he held an ancient .45 revolver. The muzzle gaped blackly at Cullin's back and the big spiked hammer was reared back. Carlos was peering down the sights of it with a malevolently glittering black eye and there was satanic anticipation in the arch of his heavy black brows.

Cullin turned slowly back to Knight. "I should have had sense enough to cover you both. And now what? I'm not going to take my gun out of your stomach until your friend takes his gun off my back. It seems to be a stalemate, Knight."

"Looks like it, doesn't it?"

"Stalemate," Cullin repeated. "So we'll just have to settle for me letting you live and your friend letting me live. It doesn't matter much—I've built up an espionage system that consistently gives satisfactory results. I've liquidated the weak and the incompetent and my work here is done; this was to be my last trip, as I said. I'm changing sides, Knight—I'm going across to where the ability to achieve results is rewarded; where a leader is expected to use his men, not pamper them."

"You ought to enjoy that."

"I will. Over there I'll have a free hand—no more hiding or secrecy. Before I'm through I'll be head of Dovorski's State Police, and the man who controls a state's police can control the state in the end. I'll use them to make every man, woman and child in Russo-Asia a cog in my machine."

"You sound rather vainglorious—but go on."

"Is there anything vainglorious about what I've done so far? When you say I'm vainglorious, you're engaging in some wishful thinking. I used my company in Korea to get what I wanted—until the very last when the old women in regimental headquarters decided sentiment was more important than competence. I've used the spy organization in this country—I used it, I didn't pet it. That's what convinced Dovorski he needed me over there. I've done everything I

claim to have done and I'll do everything I claim I'm going to do. You know that, don't you?"

Knight had the unpleasant feeling that he did, but he only said, "The proof of the pudding is in the eating."

"In a few years you'll be eating it and you'll find it a bitter dish. And now—we've chatted long enough." Cullin got to his feet, slowly, so as to not excite the trigger finger of Carlos, keeping his own pistol trained on Knight. He spoke to Carlos in Spanish. "I'm leaving. If you try anything, I'll kill your friend."

Carlos looked questioningly at Knight and Cullin smiled thinly. "Do you want to be a hero and die to have him stop me, Knight? You can, you know."

Knight's answer was to Carlos. "Keep your gun on him. If he goes out peacefully, don't shoot him. If he makes any suspicious move, kill him."

Carlos nodded, then laughed, but the revolver in his hand remained as steady as a rock.

"What's he laughing about?" Cullin demanded.

"I think it amuses him to think of the results, should he pull that trigger."

"You wouldn't be around long enough to join in his merriment, Knight—remember that."

Knight smiled without answering and Cullin backed to the door, keeping his pistol leveled on him. Carlos remained at the bar, following Cullin

with the sights of his revolver. Cullin reached the door and paused a moment in it to say, "You'll be hearing about me—more and more every year and you won't like what you hear."

Then he was gone and the roar of his truck came seconds later. Knight listened to the sound of it as it took the almost-impassable road along the shore line. There would be no use trying to follow over such a road in his own pickup.

"You saved my life, Carlos," he said. "I don't intend to forget it."

Carlos laughed and slapped the revolver down on the bar. "It's a fortunate thing, my friend, that my mild nature is belied by a fierce and mustachioed countenance. Otherwise, he might have killed us both."

"It is," Knight agreed, "but I wish we could have stopped him some way."

He sighed morosely and frowned at the revolver on the bar.

"The next time I come down this way, I'm going to bring you some cartridges and a firing spring for that thing."

The doctor was waiting for him to speak.

What thoughts lay behind those staring eyes as the doctor waited? Was the doctor aware of how swiftly death was approaching? But of course—the doctor had changed the words on the communications panel in front of the empty pilot's chair. They now read: OB-

SERVER HAS A LIFE EXPECT-
ANCY OF ONE HUNDRED HOURS
AT PRESENT ACCELERATION.
DEATH FOR OBSERVER WILL
RESULT UNLESS ACCELE-
RATION IS REDUCED WITHIN
THAT PERIOD.

*The doctor would watch over him dur-
in the next one hundred hours, waiting
for a pilot he knew did not exist to re-
duce the acceleration. For one hundred
hours the doctor would wait, knowing as
fully as he that no spectral finger would
reach out from the empty chair and press
the deceleration button.*

*The doctor could reduce the accelera-
tion. The doctor knew he wanted it done
but the doctor was waiting to be ordered
to do so. He had only to speak two words:
"Reduce acceleration." The doctor would
obey at once—the doctor was patiently
waiting for him to speak the words.*

*But the doctor knew he couldn't
speak!*

There was a soft thump outside
the door of his cottage and Knight left
his after-breakfast coffee to pick up
the morning paper. His cottage set on
the slope above Computer Center
with the near-by Miles cottage his
only close neighbor, and the Center
laid out below in neat squares. The
gray concrete hemisphere that housed
the Master Computer was at the
southern edge of the city with the four
laboratory buildings grouped beyond
it. Beyond them the landing field
reached out into the desert and the

desert stretched on to the harsh, bold
mountains to the east.

Center hadn't looked like that, at
first. In the seven years he had been
there it had grown from a random
scattering of army barracks into a
city of four thousand with all the
bustle and ambition of a city that in-
tended to grow still larger. Even then
it would not be a large city as cities
go but it would, in its way, be the
most important city in the world. One
of its achievements alone, the synthe-
sis of food starch, would soon gain it
that distinction.

He carried the paper inside and
spread it out on the breakfast table,
to read with certain skepticism:

CHUIKOV NEW AMBASSADOR

Nicolai Chuikov has been appointed the
new ambassador to the United States.
Demoted in the first post-war years from a
position of power in Dovorski's cabinet to a
minor clerical job in an obscure province for
his expression of the desirability of trade and
friendly relations with the West, Chuikov has
been reinstated with honors. This is in line
with a softening of the anti-American attitude
that first became evident two years ago; an
increasing emphasis on the need for East
and West to observe the nonaggression agree-
ments of the peace terms and a cessation of
communistic underground activities in the
West.

Chuikov's appointment has, of course,
received the blessings of the official press,
the New Socialist. The New Socialist, which
viciously condemned Chuikov as "pro-
Western" and "a menace to the People's
State" six years ago, now extols him as "the
best qualified man Premier Dovorski could
have chosen for the important task of
creating good will between East and West —"

Knight snorted. It was true that

there had been no official red activity in America during the past two years, but efficient workers didn't advertise themselves. And the Iron Curtain showed no signs of any raising in the near future.

An item near the bottom of the page was more interesting:

TRAITOR MOVES UP

The ambitious American traitor, William Peter Cullin, was promoted to Commanding Supervisor of the Socialist State Police today. He was lauded by the New Socialist for his "patriotic and tireless zeal in strengthening the efficiency of the police and enabling them to guard Russo-Asia from traitors against the people."

Cullin, once head of the red spy network in this country, has acquired the dubious honor of being the first American to ever rise to a position of considerable power in an enemy country. He renounced his American citizenship two years ago, after having served eighteen months as a behind-the-scenes co-planner of Socialist State Police operations. His "efficiency" in ridding Russo-Asia of "traitors against the people" has been remarkable for its machinelike precision and thoroughness —

There was a sudden racket outside, a sputtering and rattling, and he looked up from the paper in time to see an ancient and rusty coupé approaching his driveway. It was June Martin and he sighed instinctively, then flinched as the coupé, without reduction of speed, whipped into his driveway, spraying red petals from the rambler rose at the driveway's entrance. It slid to a brake-squealing, shivering halt and the driver climbed out with a swirl of blue skirt and a flash of bare legs. She observed the

furrows her wheels had plowed in the gravel with evident satisfaction, then shook her head sadly at the sight of the rambler rose trailing from the battered rear fender.

Knight opened the door and she came up the walk with an apologetic smile. "Sorry about your rose, Blacky. I had my car's brakes fixed yesterday and I wanted to try them out." She looked back at the disreputable coupé and the furrows it had plowed in the gravel of the driveway. "Not bad, eh?"

"A matter of opinion," he growled. "Come on in and have a seat, then tell me where your brain, such as it is, was when you were *approaching* the driveway. Why didn't you slow down then?"

"Oh, I suppose I should have," she admitted, entering the cottage. "I told you I was sorry." She picked up the percolator on the table. "Any coffee left over?" she asked, pouring herself a cup.

"What brings you here so early on the day I'm supposed to go fishing and forget my job and haywire assistant?"

"Haywire assistant, you say?" she asked, setting down the cup and smiling with anticipation. "And you were going fishing, you say?"

"All right—get on with it. I see the delight in your sadistic little soul. What's come up?"

"I'm the special messenger of Dr. Clarke this morning. You will go to Lab Four at once, to meet some high

brass who wants to see how we're getting along on our spaceship. And then, my friend, you will spend the rest of the day checking the SD-FA blueprints."

"I will?" He stared gloomily at her from her dark, curly hair to the small foot that swung back and forth from her crossed leg. "That sounds like a lot of fun. If you hadn't been such an eager-beaver in your role as messenger, I would have been gone from here in another ten minutes; on my way to the Colorado River and a pleasant day of catfishing. I've been looking forward to this day all week, and now *you* have to throw a monkey wrench in the works."

"Glad to do it," she assured him. "You needn't feel so humbly grateful about it. Besides, the day won't be wasted for the catfish—I'll be glad to take your new streamlined fish pole and your new streamlined coupé and go fishing in your place."

"You'll go with me to Lab Four."

"I? Your haywire assistant? Why should I?"

"Because I said so. Checking those blueprints is going to be a long job and I can't imagine myself doing it alone while you loaf all day and happily reflect upon all the grief you managed to cause me."

"I can," she said, smiling, "and it makes pleasant imagining."

"Well, it never will be any more concrete than it is right now. You're going with me and you're lucky I

don't wipe that smile off your face by giving way to the impulse to lay you across my knee. In fact, one of these days I will."

"Oh?" Her brows arched, mockingly. "Why don't you try it? I'll bet you'd forget you were mad before you ever . . . *don't you dare!*" She dodged behind the table as he started toward her. "I take it back—I take it—" He reached over the table and seized her by the upper arms, to bring her kicking and struggling across it. "*Blacky!* If you spank me, I'll . . . I'll—"

The musical jangling of the doorbell sounded and he released her. She straightened her clothes and smiled triumphantly. "Saved by the bell!" she jeered.

"A stay of execution," he promised, then called: "Come in!"

The door opened and Connie Miles stepped through, swinging a straw hat in one hand. "Hi," she greeted. "Look—no cane this morning." She walked the few feet to them with steps that were almost normal. "How was that?" she asked, the gray eyes in her young face alight with pride.

"That was wonderful!" June hugged her sister with affectionate delight, then dragged over a chair for her. "You're getting better every day. I told you that you would walk as good as ever, some day. I told you that a year ago when you were in a wheelchair, remember? And now you're



doing it!"

"Not yet," Connie said, taking the chair, "but I intend to in the end. The doctor said to take exercise every day and that's what I'm doing." She looked at them questioningly. "You two are going somewhere for the day, I suppose?"

"Ha!" June laughed. "We're going somewhere—back to work. *He* was very much upset by the news. In fact, only your timely arrival prevented the big ox from laying a hamlike hand where it would hurt the most."

"Oh?" Connie smiled at her younger sister. "Maybe he was just taking up where I left off on the job of trying to spank some sense into you."

"My brain isn't *there*," June ob-

jected. "Besides, it's George's fault, not mine, that we have to work today. I don't suppose we ever will be able to teach him to act like a human being."

"Then he did something to cause Tim to have to stay overtime?" Connie asked. "Tim phoned that he had to stay for a while, but he didn't say why."

"Probably too mad to want to rehearse the details," Knight said. "As the ship's pilot-to-be, Tim likes everything to progress smoothly in its construction and George sometimes introduces an unexpected ripple."

"George was supposed to check those blueprints," June said. "He didn't—I wonder why?"

"We'll find out when we get there," Knight answered, then spoke to Connie. "Do you want to go along? I can get you a pass."

"No, thanks." Connie stood up and rested her hand on the back of the chair. "I wouldn't want to try that much standing on hard concrete, right now. I'm going to take a walk down Saguaro Street this morning—if Tim gets home before I do, he'll know where I am."

"Look—don't overdo that walking," June said, concern for her sister in her voice. "I know it's doctor's orders, but don't try to walk too much in one day."

"Oh, I won't try to make a marathon of it, honey. I take my time and every day I seem to be a little stronger and more certain in the way I can walk. If this keeps on, I'll be able to go back to my old job in another year or two. And now, you two be on your way to your mechanical marvels—I'm going down to that little park by Saguaro and Third where there's a chipmunk who loves peanuts."

She left the house, walking with the slow, careful steps of one who has not walked unaided for a long time; a slight little thing with gray eyes too large for her face and too wise and understanding for her age, going with one pocket of her white sweater bulging with peanuts to feed a saucy and impudent chipmunk.

June watched Connie's progress

through the window. "Do you think she ever will be completely well again?" she asked. "She's getting a little better all the time—she'll be completely well one of these days, won't she?"

There was an unconscious pleading for assurance in June's voice and he made his own casual and confident. "Of course. There isn't any doubt about it."

"She wants to go back to her job. It takes all kinds of people to make the world, and Connie is the kind to restore your faith in all of them. All she asks is to be able to walk again so she can go back to the hospital and take up her job as nurse—go back to caring for the sick and the hurt."

"She will in another year or two. That last operation on her back really was the last operation—she won't need any more."

"Mama died when I was six and Daddy had to be away all day, working," June mused, still watching Connie through the window. "Connie was only ten. It was a good thing she was so wise and so sensible for her age, or they would have taken us away from Daddy. Connie showed them—she kept the house clean and my dirty face washed and my clothes clean. She was the one I went to when I got skinned up, or I got my feelings hurt. Part of the time she was my sister to play with but most of the time she was my mother."

June turned away from the window

and looked up at him. "Why did it have to be Connie who got hurt in that wreck? Why couldn't it have been someone the world wouldn't miss—like me?"

"Connie will get well—you just give her time and you'll see. Now cheer up, little worry-wart, and let's be on our way."

"In my car?" she asked, the devilment back in her eyes.

"No, not in your car. We'll take mine—I want to get there in able-bodied condition."

"We'll take mine," she corrected. "You can't get yours out of the driveway until I let you."

"Get your junkpile off to one side and I can."

"Oh, come on—don't be a coward!" she begged. "Let me drive you down."

He sighed with resignation. "All right, then—let's go."

June drove the eight blocks to the Computer area gate with an excess of reckless abandon and a roaring of the mufflerless engine that made conversation impossible.

"One of these days," Knight said as the coupé bucked and shivered to a stop before the gate, "you're going to go hell-for-leather around a corner like that and take the front end off a patrol car. And then what are you going to say to them? Tell me that—what *can* you say?"

"The wrench is on the floor."

"What?"

"I said, 'The wrench is on the

floor!' If you want to get out, you have to open the door. The door handle is broken off so you have to turn that little stem with that wrench."

He sighed again and felt for the wrench. "Nature blundered hideously with you; you should have been born a boy."

Another car stopped at the gate as Knight, with the aid of the wrench, opened the door. It was an Air Corps car, with four stars on the license plate. Dr. Clarke climbed out, to be followed by a tall man with neat gray mustache and four smaller duplicates of the license plate stars on each shoulder. Knight walked to meet them, June beside him.

They were greeted by Dr. Clarke, a small, gray man with quick, nervous movements. "Glad Miss Martin was able to reach you before you left for the day, and I'm sorry this had to come up." He made quick introductions. "General Gordon, this is Mr. Knight and this is Miss Martin, his assistant."

The general acknowledged the introductions with a brief handshake with Knight and a slight bow to June. "Very interesting, the work you're doing here," he remarked politely. "I was here once before—saw the Master Computer that's making such a big change in the lives of all of us. I would like to see the progress you're making with the ship this time. I can't stay long, as much as I would like to take

a look at some of the marvelous things the papers say the 'Big Brain' has thought up for us."

Knight gave Clarke an amused side glance. The general caught it but said nothing until they were through the guarded gate and in one of the sedans used for personnel transportation within the Computer and laboratory area. The general and Clarke got into the back seat and June slid under the wheel without invitation. Knight seated himself beside her, gave her a warning and significant look which she returned with one of bland innocence, and she set the sedan into motion.

General Gordon spoke then. "My remark seemed to amuse you, Mr. Knight. Would you tell me why?"

"Of course." Knight turned in the seat to face the general. "The newspapers have a habit of dramatizing anything new or unusual. They credit the Master Computer with a great deal of intelligence, which it has, and with a great deal of originality, which it does not have. Actually, it couldn't 'think up' a mouse trap—or it wouldn't, rather."

"I find that hard to believe," the general answered. "It's thought up several very important things—a space-ship drive, the synthesis of starch, the anticancer serum, the atomic motor—a great many things. Wasn't the Computer responsible for all those?"

"Partly," Knight replied. "It really should be called a 'Data Correlator.'

It only knows what we tell it; it has no curiosity and therefore no incentive to acquire new knowledge.

"For illustration: Suppose we want it to devise a better mouse trap for us. Should we simply say: 'Invent a better mouse trap,' it would do no more than to reply, 'Insufficient data.' It's up to us to supply the data; it has no volition to look for its own unless instructed to do so. So we would gather all the data pertaining to mice and traps that exists. We would give that to it as proven data. We would also give it theoretical data containing all the as-yet-unproven theories of mice and traps and we would label it as such. Of the proven data we would say, 'This is valid and proven data; use it as it is.' Of the theories we would say, 'This is theoretical data; ascertain its validity before using.' Then we say, 'Build us a better mouse trap'—and it does."

"I see." The general nodded. "The papers have been stealing your thunder then, and giving it to the Computer?"

"Not only our thunder but the thunder of Newton, Roentgen, Richards, Faraday, Einstein—the thunder of all men who ever contributed to human knowledge, clear back to the first slant-browed citizen who came up with the bright idea that a round wheel ought to roll."

"The Master Computer gets the credit," Clarke commented, "but we

don't mind here at Center. The data that we, personally, have originated for it is but a small part of the mass of data that is its knowledge. As Knight said, the credit goes to all men who ever thought of something new or observed a new fact, on back to the inventor of the wheel."

"I would say this co-operation between Man and Machine has worked out very satisfactorily," General Gordon said. "The results are proof of that."

"Very satisfactorily," Clarke agreed, "so long as we keep a few fundamental facts in mind. By the way"—He motioned toward the building they were approaching—"that's Lab Three, where we condition the robotic brains—mainly the D Twenty-three model, such as your own Air Corps ordered. Would you like to see the conditioning process?"

"I would like to, but I'm afraid I haven't the time."

June, who had slowed the car, resumed speed and they drove on to the high, square bulk of Lab 4.

"Lab Three isn't much to see, important though it is," Clarke said as they climbed out of the car and walked toward the Lab 4 entrance. "The D Twenty-three brains in their final stage of assembly look like nothing in the world but foot-square tin boxes—or stainless steel boxes, rather. Each brain is inspected and tested for flaws after final assembly, then taken to the conditioning chamber where it's given

its knowledge. This is a process roughly equivalent to teaching a young child but with the advantage that the brain has the learning capacity of an exceptionally intelligent adult plus a perfectly retentive memory and a perception so fast that all visual and audial material, such as sound films, can be given to it at several times normal speed. Although, even at that speed, the period of learning amounts to almost two thousand hours."

"Remarkably fast learning, I would say," the general commented. "Once you produce enough of such mechanical brains, the human brain will become almost a superfluous and unnecessary organ so far as being needed to contribute to our new technical type of culture is concerned."

"Have you forgotten the hypothetical mouse trap, general?" Knight asked.

"No, but the brains lack only self-volution," the general replied with crisp decision. "Once you create that in them, they will be our mental equals—if not superiors."

"Yes, once we do that," Clarke agreed dryly.

The guards at the entrance inspected their identification, then passed them on. Knight opened the door and they stepped into Lab 4.

The ship stood in the center of the room, dominating everything else. It was forty feet from the floor to the end of its blunt, round nose and the

four tail fins it rested on had a radius of fifteen feet. It did not have the slender, cigarlike form that artists had anticipated spaceships would have; there would be no air in space to hinder its progress and it would need no streamlining. It was shaped more like a great, round-nosed bullet, forty feet in length and twenty feet in diameter. Its outer skin was a hard, bright chromium alloy, and it reflected the walls of the room in insane distortions as they walked toward it.

The ship's entrance was near the bottom and Miles was waiting for them by its ramp; a rangy, homely man who usually had a smile for everyone but who now wore a harried expression. Vickson appeared from around the ship; a slightly stooped man with mild blue eyes behind his rimless spectacles.

Clarke again made introductions. "General Gordon, Mr. Miles and Mr. Vickson. They'll be the pilot and observer."

The general acknowledged the introduction and asked: "How about the others? I understand the ship will take a full crew on its first flight."

"Once it's made a successful test flight—which Miles and Vickson will make with it—it will have a full crew for interplanetary explorations," Clarke said. "We're selecting and training the other members of the crew now."

The general took a backward step and ran his eye up the length of the

hull. "Progress seems to have exceeded the estimates you made a year ago. How about the drive—is it installed yet?"

"It would have been if George hadn't taken things too literally again," Miles spoke up.

"George?" The general raised his eyebrows inquiringly and Clarke spoke to June. "The general has never seen George. Go get him, will you?"

June walked across the room to the door marked: ASSEMBLY 1 and Clarke said to Miles, "Go ahead, Tim—tell General Gordon what happened."

"It wasn't Vickson's fault," Miles began. "A man gets so accustomed to George being so intelligent and capable that he sometimes forgets and isn't specific enough—or in this case, Vickson was *too* specific. A human would have known what he wanted, but George—"

The door of ASSEMBLY 1 opened and Miles stopped talking as the general stared at the robot that was approaching them. It was a manlike monster of steel, seven feet tall and walking as silently as a cat on its rubber-soled feet. June walked beside it, a ridiculously tiny thing beside its own ponderous bulk.

"So that's George?" The general shook his head in amazement. "This is your new type robot, then? You've not only given it a manlike body, you've even given it almost-human features. In an alien sort of a way the

thing is *handsome*."

"The almost-human face was purely by coincidence," Clarke explained. "Its D-Twenty-three brain is in its chest, of course, and it so happened that installing the eyes, ears and mouth gave it a head of normal size—that is, a head of a size normal for the size of its body."

The robot stopped a few feet in front of them and inclined its head downward so that its eyes were on theirs; eyes that were large and dark, giving it an appearance of thoughtful, patient waiting.

"Two eyes were necessary for it to properly estimate distances," Clarke explained. "The rather humanlike ears are acoustically efficient and their location, together with locating the speaker grill as its mouth, was to enable it to do such things as use a phone."

"It phones?"

"Oh, yes. George can do anything. He checks data with the Master Computer at times—there's a line for that purpose—checks blueprints and installed circuits, assembles parts. He is very useful and, since he never gets tired or needs sleep, he works twenty-four hours a day."

"Hm-m-m." General Gordon studied the robot thoughtfully. "Apparently we'll have no trouble training the D-Twenty-three's for duty in the Air Corps."

"Well, they *will* have to be trained, and under the supervision of Center

technicians. Mr. Miles' account of what happened last night will show you why."

"Oh, yes—the trouble with the robot. Please go on, Mr. Miles, and tell us what happened."

June looked inquiringly at Clarke. He nodded and she said to the robot, "They're through with you, George—get on back to work." It turned without a word and walked across the room and through the door of ASSEMBLY 1.

"It started just as Vickson here went off-shift," Miles began. "Vickson was working on the final assembly of the drive and came to the K-Seven reflector at the end of his shift. It's a very essential little item, though its installation is simple. But it had to be coated with the Reuther Alloy, first. This reflector is a circular plate of platinum, eight inches in diameter, and we were to do the alloy plating here—they sent us a special machine for that, yesterday. The alloy has to be of a certain thickness—sixty-five one-thousandths of an inch. So, as Vickson went off-shift, he gave George the plate and told him to metal-spray it to a thickness of sixty-five one-thousandths of an inch.

"This alloy is so hard to produce and so expensive that we had orders to waste none of it, if possible. Vickson ordered George to use the only method possible whereby the proper thickness would be put on the plate in one

operation, with no guesswork and no surplus to machine off; he told George to determine the surface area of the plate then weigh out the proper amount of alloy to coat it the required thickness. This should have been a simple job, quickly done, and George was to then install the plate—a job even simpler. The entire thing shouldn't have taken George over twenty minutes.

"When I came to work an hour later I took it for granted everything had been done. I had the workmen put in the drive shields and I went ahead with circuits in the control panel. I was a fool not to check with George, first, but it's like I said; George is so intelligent and competent that you sometimes forget he isn't human. It was six hours later that I went into the assembly room, over there, to see why he hadn't brought out the parts he was supposed to be assembling."

Miles breathed deeply, and sighed. "He wasn't at his workbench. He was at the blueprint table, figuring. He had a pile of papers beside him ten inches high, all covered with figures. The K-Seven reflector plate was over by the sprayer, not even touched—"

Clarke interrupted him. "For General Gordon to understand the peculiarities to be expected from D-Twenty-three's, we had better let Vickson tell us his exact words to George."

"It was stupid of me," Vickson

said, almost apologetically. "I made the mistake of giving him a specific order and expecting him to follow it as a human would have—to a certain degree of precision and no farther. My words were: 'Take a pencil and paper and determine the exact surface area of this plate, then weigh out the proper amount of alloy to coat it sixty-five one-thousandths of an inch.'"

"A human would have determined the area by the formula: Point seven eight five four times the squared diameter. Although not exact, it's close enough. But I had told George to determine the exact area of the plate and that's what he was trying to do, using the other formula: Pi times the squared diameter, divided by four. He would still be at it if Miles hadn't stopped him."

"Why?" the general asked. "The formulas are the same."

"No—" Vickson shook his head. "In the first one, a human has already decided how far the decimal of pi should be carried. This, though close enough, is not exact. I had told George to determine the *exact* area of the plate, and to do so he had to use the second formula which contains pi as an endless term."

"But that's absurd!" the general objected. "You claim the robot is intelligent—didn't it know it could never find the last decimal place of pi?"

"George knew, but he was simply following orders," Clarke said. "The

duty of a machine is to obey orders, not place special interpretations on them."

"And you had to have the drive shields taken off again?" Knight asked Miles. "Is the plate sprayed, now?"

"It took George no more than five minutes after I told him to use the point seven eight five four formula," Miles replied, "but we lost the entire shift on that part of the ship, due to his cussed attention to detail."

The general frowned thoughtfully. "Why not teach it to understand the purpose of this ship as a whole, as well as the purpose of the ship's component parts?" he asked. "The entire thing is very simple: We want a spaceship. We want it equipped with an efficient drive plus disintegrator rays for protection against meteors. We want all this accomplished as soon as possible. Surely, as intelligent as it is, it can comprehend the purpose of the work—the ultimate goal—and learn better than to repeat any such off-on-a-tangent idiocy as this pi business."

"How do we explain 'purpose' to it?" Clarke asked. "A machine understands only 'Is' and 'Is not'—it can't understand human desires and purposes since they are based on 'I want it to be' and not on 'Is' and 'Is not.'"

"Well—you should know if it's impossible," the general said, but he did not sound entirely convinced.

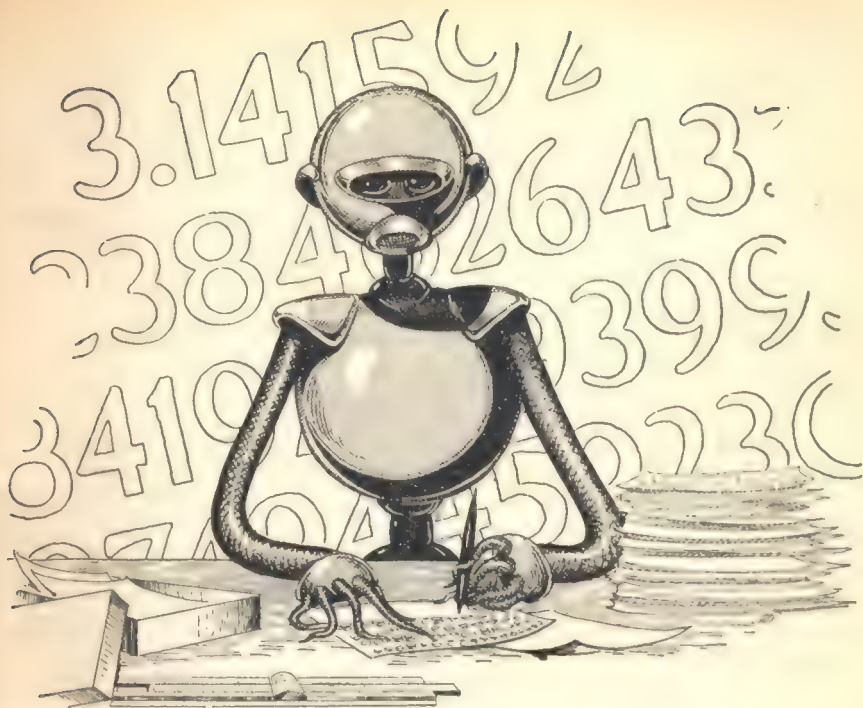
"We have a slogan—a philosophy, you might say. Mr. Knight suggested it several years ago and we have it plastered on the Master Computer, itself, to keep us reminded of the gulf that will always separate Man from Machine. You saw it, general—a simple little five-word sentence."

"I remember it. It seems to me you're exaggerating the importance of it, but I'm a military man and certainly in no position to argue the characteristics of robots with the men who created them." He looked up at the ship again and changed the subject. "Are the disintegrator ray projectors installed?"

"Not yet," Clarke answered. "We've given the Computer the job of devising a safety gadget that will prevent the operation of the ray projectors whenever the ship is within an atmosphere dense enough to produce a feedback of the rays."

"Although the situation is looking less and less like war, you can never tell," the general said. "The disintegrators would serve as a terrible threat of retaliation. However, rather than having the rays as a strictly offensive weapon used from a spaceship, it would be more desirable to have ray projectors mounted along the borders of this country. They would make the perfect defense weapon—no force by air, land or water could get past them."

"Except for the feedback," Clarke said.



"Except for the feedback—and I know without asking that you haven't been able to do anything about it."

"This chain-reaction feedback is a tough problem. We haven't solved it yet. The projector actually projects two rays, which you might call A and B. They merge at a point about twenty feet in front of the projector and disassociate the atomic structure of any material in their path from there on. The maximum range is controllable, however. In empty space, A and B are harmless—until they unite. But there's the chain-reaction

feedback within an atmosphere and the disassociating effects of combined A and B follows the ununited A and B rays to their source—the ray generator. The result is that the ship, and any material within a radius of one hundred feet, is transformed suddenly into a cloud of disassociated atoms. It was designed for protection against meteors in space, where there would be no feedback."

"I hope we never have to use it against anything but meteors," the general said. "I'm a military man and the competent military leader wants a

permanent victory. Should war ever come, we must avert defeat at all costs but a victory won with the disintegrator rays, projected from a ship in space, would only sow the hatred for another war."

"Why do you say that?" Knight asked.

"It's a human characteristic to say of defeat at the hands of an enemy no better armed than you—and with greatly varying degrees of philosophical acceptance—'The fortunes of war.' But Russo-Asia's defeat by a disintegrator ray, projected from an invulnerable ship in space, would arouse the reaction: 'It wasn't a fair fight—we never had a chance.' Victory would be ours, but victory by such a means would create a resentment and hatred that would be long in dying."

"I can see your point, general," Knight said. "But you do intend to use the disintegrator if necessary, don't you?"

"We don't want to have to use it, but we certainly shall if we're forced to," the general answered. He smiled faintly and added: "There's an old saying, and a true one: 'The very worst peace is better than the very best war.' To that should be added an equally true fact: 'The very worst victory is better than the very best defeat.'"

He looked at his watch, then at Clarke. "I'm afraid my time is running short, and I'd like to look through the ship before I go."

"Of course," Clarke said. He turned to Knight. "I'm sorry this came up to spoil your day, but we have to make up for the time George lost us. If you'll make the check of the SD-FA blueprints, with Miss Martin's assistance, we'll have the lost time made up by night. By the way"—he looked toward the ASSEMBLY 1 door—"where did Miss Martin go?"

"She's in with George, I think," Knight said.

"Probably already checking her share of the work," Clarke said with an approving nod. "You have a superb assistant in Miss Martin."

The four of them went into the ship and Knight walked across the concrete floor to the door of the assembly room, smiling at Clarke's statement. June was a superb assistant, despite her youth, but she was hardly the type to exercise her abilities when less important and more interesting things could be found to do.

He opened the door to find her, as he had expected, busily pestering the stoic George. "Don't you understand that one, either?" she was asking. "Tell me what the point was."

George answered her without pausing in his deft assembly of the work on the bench before him. "I understand it. It can be interpreted in either of two ways; as an expression of a feeling of pleasure or as a factual statement of the loss of the ability

to phosphoresce."

"What goes on?" Knight asked.

"I've been trying to develop a sense of humor in George," she said, making a face at the unmoved robot. "I told him jokes and explained the points, but it's a waste of time. He just can't see the funny side of *anything*."

"You ought to know better than to even try. What kind of jokes did you tell him, anyway? What was this one about not being able to phosphoresce?"

"What the firefly said when he got his tail cut off—'I'm delighted!'"

"Oh." Knight pulled his mouth down and shuddered. "No wonder George refused to laugh at *that*. Not even the most genial human-being could see anything funny about such a stup—"

"Never mind!" she interrupted him. "I think it's funny." She looked toward the doorway. "Where did the brass go?"

"Up into the ship. You and I are to check these blueprints. You can check the electronic circuits of the initial and restraining stages and I'll take the rest."

"Well—" she sighed philosophically, "at least I know what I'll be doing the rest of the day—and it's all the fault of that humorless pile of tin."

"Speaking of jokes"—Knight spilled the blueprints out of the brown envelope and spread them on the table—"did I ever tell you about the traveling salesman who asked the

farmer's daughter if—"

"Never mind that, either!" she interrupted him firmly. "Do you want to shock George?"

Silence.

There had been utter silence from the first; the silence enclosing him and the dark eyes watching him. Why did the doctor move so quietly? Was it because he was dying; was it because people always walk softly in the presence of the dying?

Of course! His doctor was showing him the respect that is due the dead—and the soon-to-be-dead.

For a moment the tide of insanity almost broke through the bulwark built around his mind by the antihysteria drugs; the insanity he so desperately longed for; the insanity that would let him die in mindless, unfrightened madness.

The words above the pilot's communication panel now read: OBSERVER HAS A LIFE EXPECTANCY OF TWENTY HOURS AT PRESENT ACCELERATION. DEATH FOR OBSERVER WILL RESULT UNLESS ACCELERATION IS REDUCED WITHIN THAT PERIOD.

The urge to laugh came to him. It was funny! The doctor wouldn't reduce the acceleration until he gave the order and he couldn't give the order until the doctor reduced the acceleration.

Funny! The butterscotchmen couldn't run unless they were hot and couldn't

get hot unless they ran. . . . Couldn't run unless they were hot—Couldn't get hot unless they ran. . . . Couldn't run—Couldn't hot . . . run . . . hot . . . run . . . hot . . . vicious circles and circles vicious, spinning around and around . . . spin around and around and around and around till your mind flies off into the darkness where someone is laughing. . . . How pleasant to go laughing and spinning into the darkness, around and around . . . laughing and spinning and spinning and laughing . . . around and around and . . .

Sanity jolted into his mind with all its cold, grim reality and the comfort of the brief delirium vanished. The doctor was standing over him, injecting the anti-hysteria drug into his bloodstream.

The desperate fear ran through him again, terrible in its helpless impotency. It was always the same; the doctor watched him ceaselessly, ready to move forward and deny him the solace of madness at the first sign of its coming.

The doctor didn't hate him—WHY MUST THE DOCTOR TORTURE HIM SO?

It was a year later, with the ship six days from the morning of its test flight, that the Russo-Asiatic Soviet completed the about-face in their foreign policy and promised the removal of the Iron Curtain within the week, plus freedom of Western representatives to inspect their "greatly reduced military strength." It was not, to Knight, a surprising or mys-

terious thing. Russo-Asia had been built on false promises and deceit; this last action, he feared, could have but one reason behind it.

It was the other, happening five days later, that sent the chill certainty, too late, into his mind—the discovery that a tentacle of Cullin's presumably dead espionage system was in the very heart of Center . . .

It was with relief that Knight led General Gordon and his five-star superior, General Marker, to the control room of the ship. He had shown them the ship from bottom to top, explaining its workings and answering questions until he was beginning to feel like a tourist's guide. Furthermore, it was late in the night—or early in the morning, rather—and he would have little sleep before returning to be on hand for the ship's first take-off.

"And this is the control room," he said. "The first seat, with its control and instrument board over there, is for the pilot. This one is for the observer." He indicated the seat and instrument board immediately behind the pilot's. "You'll notice the observer has only a few instruments, but several viewscreens. The pilot can control the ship manually, with those buttons on his control board, or by voice command to the robot drive control—a D-Twenty-three. In an emergency, the observer can control the ship by voice command to the drive control, but his panel is not

equipped with manual control buttons. The observer's duties are to observe and record, as well as to maintain constant contact with Earth."

He pointed to a small viewscreen in the center of the observer's panel. "This is his contact with the auxiliary control station. You both saw it—that little steel building two hundred feet west of this one. A man will be on duty at all times in it. He flipped a switch and the screen came to life, to show the back of an empty chair and a steel door beyond. "No one on duty right now, of course, but there will be when the ship takes off."

"What is the purpose of this ground-control station?" General Marker asked. "I know, of course, that it's an auxiliary means of controlling the ship, but why?"

"It's a safety measure we hope we won't have any need for. We're convinced that the ship has no bugs, but we don't want to take any chances with men's lives. So we have the constant communication with the observer plus the auxiliary control of the ship's drive. Should something go wrong, such as both pilot and observer becoming unconscious, we can bring the ship safely back to Earth from our ground-control station."

"Which method of controlling the ship takes precedence, the pilot's manual control, his oral orders to the drive control, or the means of controlling the ship from the ground-control station?"

"The control from the ground overrides all forms of control from within the ship. As I said, we're convinced the ship has no bugs, but no man has ever gone into space before. It might possibly be that a man would crack from the experience, and if he did he might give any kind of orders to the robot drive control—even such a one as ordering the disintegrators turned on Earth. We don't expect anything like that to happen, you understand—Miles and Vickson were selected for their mental stability—but we like to play safe."

"Will the crew include a doctor?"

"The very best, so far as technical skill goes. But circumstances might arise where more than technical skill would be needed, so that's why we have the auxiliary control station."

General Gordon tentatively touched a red knob on the observer's panel. "Does this turn the disintegrators on?" he asked.

Knight nodded. "It turns them on, and also controls the maximum range. The Computer gave us that safety gadget I spoke of when you were here a year ago, so now we don't have to worry about them being turned on accidentally and destroying the ship." He spun the red knob to the right and the generals exchanged nervous glances. "It's on full intensity, right now. This safety gadget prevents the closing of the circuit so long as the ship is within an atmosphere dense enough to produce a feedback of the rays."

He turned it off again and General Marker remarked, "You certainly go all the way in trusting your gadgets here."

"A soundly built gadget *can* be trusted."

"Then why your five-word slogan—the same as you have on the Master Computer—in big letters here on the observer's panel?"

"It's different when a gadget has an intelligence. The observer, in an emergency, would have to control the ship through a robotic brain. That five-word sentence, which is actually a sound philosophy to keep in mind when dealing with machines, is to remind the observer that he is not giving orders to a human pilot."

"Although it's six hours until take-off, I suppose the ship is ready to go right now?" General Gordon asked.

"Ready to go, and Miles and Vickson are now getting their last hours of sleep—the last hour, to be exact. They'll be back down here in less than two hours, together with myself, Dr. Clarke, and about a platoon of technicians to make the last-minute check of all the other checking. We have something too big in space flight to chance any errors on the first attempt."

"I'm glad this ship's first flight will not be as a weapon of war," General Marker said, "but I trust it's well guarded—just to play safe, as you said of your ground-control station."

"You saw the guards outside,"

Knight answered. "And there are guards outside the door of the ground-control station—this ship can't lift while enclosed in this steel building and the controls that lower the roof and walls into recesses in the ground are inside that station. We still have the machine-gun towers that we erected seven years ago when war seemed just around the corner. The antiaircraft artillery is still stationed in a wide circle around Computer Center—no one ever got around to ordering their removal and the guns were still manned twenty-four hours a day, the last I heard."

"Well, if Russo-Asia has any plans for this ship, they've certainly kept them well concealed," General Marker said. "Our Intelligence reports no indications whatever of any such thing. And now, I think we had all better get out of here and take advantage of that less-than-two-hours sleep we'll get before the preliminaries start."

Knight noticed, as they went down out of the ship, that George was still in the drive room, checking the control panel to drive circuits. The robot did not look up from its work, though it saw them pass. Robots confined their speaking to necessary answers and wasted no time with such amenities as "Good morning" and "Good night."

He parted company with the two generals at the Computer area gate;

they to return to their Center hotel and he to drive through the slumbering streets to his own cottage. Tired and sleepy, he set the alarm to arouse him in an hour and a half and went to bed.

He had been asleep an hour and fifteen minutes when he was awakened by the ringing of the doorbell and June's voice. "Blacky—wake up!"

"What is it?" he called, swinging his feet to the floor and reaching for his clothes.

"Come over to Tim's house." There was both indignation and urgency in June's tone. "See if you can straighten things out."

He heard her hurry back to the Miles' cottage, her footsteps clicking sharp and fast on the walk. He grinned, despite his worry that Tim might be in some kind of trouble—the manner of her walking indicated that June was beginning to get *mad*.

He put on his clothes and went out into the pre-dawn darkness. The lights were on in the Miles' cottage and there was a black sedan parked at the curb before it. It had a government-service license plate, but there was nothing about the number on the plate to indicate the type of service it represented.

Tim Miles' voice came from within the house, angry and incredulous, and a vaguely familiar voice answered him. Knight went to the door and entered without knocking.

There were four in the room; Tim

Miles, Connie, June, and a cold-eyed man in a gray suit. Knight recognized him with a start; his name was Whitney and he was a Security man. He returned Knight's "Hello" with a nod of recognition and Connie, sitting in a chair by the card table, said, "Hello, Blacky." Miles, red-faced and scowling, hardly glanced away from Whitney, while June sat one-hipped on the card table beside Connie, her eyes smoldering and her hands gripping the edge of the table until the knuckles were white.

Knight stopped beside Whitney. "What is this?" he asked.

"The ship has been sabotaged," Whitney replied.

"It's a lie!" Miles declared.

"Just a minute—" Knight looked from Miles back to Whitney. "It wasn't sabotaged when I left it an hour ago."

"It was sabotaged a year ago," Whitney said. "We didn't learn of it until tonight—in fact, not over half an hour ago."

"Are you sure?" Knight asked.

"I'm supposed to have done it!" Miles burst out wrathfully. "I'm supposed to have cross-wired the circuits from the control panel to the drive so that the drive will explode on take-off."

Knight made his reply to Whitney. "I can't believe that. I've known Miles and worked with him for several years. Of course, I realize that Security wants more positive proof of a

suspected man's innocence than the personal opinion of his friends. If you will give me the details, perhaps I can help."

"He isn't exactly accused, yet," Whitney said, "but he's very much under suspicion of performing the work of sabotage. As for the reasons for our suspicions, they are these:

"The robot, George, has been helping Miles and Vickson check the ship today; an extra safety measure, I understand, to make sure there will be no mechanical failures on the ship's trial flight tomorrow. Miles completed his share of the work early in the afternoon and went home. Vickson was through about an hour later and he went home, leaving the robot to check the control-panel-to-drive circuits—a precautionary measure that Miles, here, admits he insisted was not necessary. It was about thirty minutes ago that the robot finished checking the circuits. He then phoned Security—a thing he had been ordered to do if he ever found any evidence of sabotage—and informed us that the drive circuits had been so cross-circuited that the drive would explode the moment it was activated for take-off."

Miles sighed heavily. "I tell you, those circuits are *not* sabotaged! I installed them myself, and I personally welded the control panel seals."

"You say this sabotage was supposed to have been done a year ago?" Knight asked.

"That's right," Whitney said. "Miles admits that he, himself, installed the circuits and sealed the panel at that time—and the panel is still sealed."

"Yes, I admit it!" Miles snapped. "Those circuits are not cross-wired. I don't know what this is all about, but I do know the kind of job I did on those circuits."

"The robot traced the circuits and found them to be cross-wired," Whitney said. "Isn't it true that a robot never lies?"

A look of helplessness passed over Miles' face. "Yes, it's true—but there's some mistake."

Whitney turned his cold eyes on Connie who was sitting quietly in her chair, watching Whitney with a composure that was in such striking contrast to the ever-growing wrath of the hot-eyed June.

"There's something else—" he said, and June froze into a waiting tenseness. "Why do you so often go to the park at Saguaro and Third, Mrs. Miles?"

Connie's eyes went wide with surprise. "I go there because it happens to be along the route I usually follow when taking the daily walks my doctor prescribed. Why?"

"You usually sit for a while beside the rock monument in the center of the park, don't you?"

"I always do. Why do you ask?"

"Why do you choose that spot to sit?"



"For two reasons; because there is a stone bench there to sit on while resting and because I like to feed the chipmunk that has a nest in the monument."

"Get to the point, Whitney." Miles could restrain himself no longer. "Quit beating around the bush—is my wife under suspicion, too?"

"We received an anonymous phone call this afternoon," Whitney said. "It enabled us to intercept a note, although the message meant nothing to us *then*. It was just a slip of paper in a tin box, and it read: 'Crisscross O.K. No suspicion. Ill on schedule.'"

"What does that have to do with my wife?" Miles demanded.

"After the robot told us of the sabotage, the meaning of the message became clear. It was an absurdly easy message to understand. 'Crisscross

O.K. No suspicion' could only mean that the drive controls were still cross-circuited and no one suspected it. As for 'Ill on schedule'—we could only take that to mean that the person guilty of sabotaging the drive controls would pretend to be ill on the day of the ship's take-off—too ill to be in the ship when its drive exploded."

Whitney turned his eyes on Connie again. "As I say, an anonymous phone call tipped us off. This person suggested we look at the monument and we found the message in a crevice inside the monument. That, Mrs. Miles, was only a few minutes after you had left there."

There was a moment of dead silence, then Whitney's voice lashed at Connie like the crack of a whip.

"What do you know about that message?"

June reacted then, and in a manner typical of her. She shoved herself away from the card table with a violence that sent it crashing to the floor and advanced on Whitney with her eyes blazing. "*Nothing, you fool!*" The words came like the spitting of an infuriated cat. "My sister isn't a spy and she doesn't know anything about that message, you . . . you—"

Her small hand flashed out to rip her nails down Whitney's face and Knight moved quickly to stop her, catching her wrist, then the other hand as she tried to whirl away from him, bringing her arms down tight against her stomach. She struggled furiously to tear loose, her heart pounding against his arm like that of a small, wild animal.

"June—don't!" Connie was beside them, to lay her hand on June's shoulder. "Quit spitting and fighting, kitten—he's only trying to do his job."

June ceased struggling but the hate still blazed in her eyes. "He called you a spy—nobody is going to call my sister a spy!"

"He didn't call me a spy, honey—he just asked me what I knew about that message."

"I understand your problem, Whitney," Knight said, releasing June but keeping a wary eye on her, lest she should renew her attack. "Someone is guilty of sabotage and it's your job to find who that person is. But aren't you jumping to conclusions on flimsy evidence?"

"I have no desire to cause anyone embarrassment or discomfort," the cold-eyed Whitney replied. "My business is to sort people into two different classes—guilty and innocent. An unexpected question suddenly snapped at a suspect will often go a long way toward indicating the person's guilt or innocence."

"Then why don't you snap some questions at a few others?" June demanded. "Vickson and the workmen who helped build the ship and George—What makes you so sure—"

"Sit down, June," Connie ordered, going back to her own chair. "Give him a chance to ask his own questions."

June hesitated, half turning away to do as her sister had ordered, then Whitney made the mistake of seconding the order. "Yes, sit down," he commanded, unconsciously rubbing his hand down the cheek that had been her intended target.

She whirled back to face him, the rebellion flaring hotly. "Never mind any such details as dictating our posture—just get on with your questions!"

She waited for him to dare repeat his order, standing erect and defiant before him, and an expression of helpless defeat flitted over his face. Knight watched with combined sympathy for him and amusement. The cold-eyed Whitney was accustomed to dealing with dangerous men and awing them—but how does a man go about awing

a hundred and five pounds of fuming, spitting female wildcat?

"I have no more questions to ask—now," Whitney said. He spoke to Knight. "Dr. Clarke was in Yuma—we contacted him by phone and he's on his way back, now. He's given orders for public announcement of the postponement of the ship's test flight and when he returns we'll continue the questioning—of everyone connected with the ship, including the robot."

"Have you questioned George at all?" Knight asked.

"Very briefly," Whitney said with a wry smile. "Questioning a robot isn't too informative—a robot does no more than answer each question as it's given. It requires time plus a great many questions to get the entire picture. We questioned the robot briefly, as I say, and learned only that his check showed the drive controls to be cross-circuited. When Dr. Clarke returns, we'll do a thorough job of the questioning."

"Have you questioned Vickson?"

"He was spending the night with friends in Center Junction, we learned. A man was sent after him and they should return any minute."

"Here?"

"We'll all meet at the Computer area gate, then we'll go to Lab Four and find just who is guilty." Whitney turned to Miles. "Since the evidence against your wife is so uncertain, and

since she is in frail health, she will remain here. If we need her, we can send a man after her. I'm afraid you'll have to go with me, now. At present, the evidence points only to you. If you're innocent, we'll do everything in our power to prove it. And if you're guilty"—he smiled grimly—"we'll do everything in our power to prove it."

"Thanks," Miles replied with the same grimness. "That's exactly what I want you to do."

Connie got to her feet. "There's no question about his innocence—it's all a ridiculous mistake. But I realize there is no way you can know that until everyone is questioned and the guilty one found. As for the message in the monument—I know nothing whatever about it. I always sit by the monument and feed the chipmunk, but I certainly never knew someone was using it as a place to leave messages for foreign agents."

"This anonymous phone call—doesn't that sound a little fishy?" Knight asked. "Have you traced it?"

"We're trying to," Whitney answered. "We're not at all convinced that Mrs. Miles is guilty of any connection with the affair. With her husband, it's different—he personally installed the circuits and they have been found to have been installed in such a manner as to destroy the ship."

"Couldn't the robot have made a mistake?" Connie asked. "Maybe they aren't cross-circuited at all—maybe the robot just made a mistake

in his checking."

"I'm afraid not," Whitney answered. "Your husband will tell you that robots neither make mistakes nor false statements."

"That's true, Connie," Miles said, going to her. "But it's also true that I didn't sabotage the drive." He put his arm around her. "I'll be back in a few hours, and everything will be all right."

Whitney moved toward the door, his eyes on Miles. Miles gave Connie's shoulders a quick squeeze and followed Whitney through the door without looking back.

Knight spoke to Whitney as they went through the door. "I'll follow you down in my own car." Whitney said "All right," then he and Miles went on up the walk. Knight turned back to the two women in the room.

"There's no question about there being a mistake," he said. "What, I don't know. We do know that someone sabotaged the drive controls, but who? We'll rip out the drive-control panel and trace the leads that way—George had to depend upon tracing them with instruments. I'll go down right now—and you'd better go with me, June. Before it's over they'll want everyone who was ever around the ship, and you've been around it almost as much as I have."

June went to the door where Knight waited, then stopped to say to Connie, "Don't you do any worrying about this while we're gone, Connie. We'll

be back with Tim's name cleared before noon, you wait and see."

"Of course you will," Connie answered, but it seemed to Knight that she was, for all her composure, suddenly very small and lonely as she stood in the empty room and watched them leave.

The sky was shell-pink in the east, lighting the world with the half-light of dawn, when he backed out of the driveway. June sat silent and thoughtful beside him; worried, despite her assurances to her sister. He drove slowly, trying to fit together the two facts he was convinced were true; Tim Miles had not sabotaged the ship, yet a robot had no incentive to lie.

There were certain characteristics of the robotic brains:

A machine is constructed to obey commands; it does not question those commands.

A machine has no volition; it neither acts nor informs unless ordered to do so.

And then he had the answer; so simple that, he felt, a child should have seen it.

A machine would not voluntarily make a false statement, but the prime function of a machine was prompt, unquestioning obedience. The robot, George, would never make a false statement by its own volition, *but it would if ordered to do so.*

He slowed the car to a barely moving crawl as he considered the implications and June looked at him

questioningly. "We're still three blocks from the gate—what's wrong?"

"The drive controls have never been sabotaged. George was ordered to make that statement, and no one thought to ask him if it were true."

"But why? What would anyone gain by getting Tim into trouble like that?"

"It wasn't for personal reasons. *Someone didn't want that ship tested today!*"

"Then it was—" June stopped as a dull, distant roaring came to them. "It must have been—"

She stopped again as the roaring increased, coming from above them and to the southwest, filling the air like the hum of a billion bees. "What's *that?*"

He stopped the car and jumped out, to look into the sky and see the source of the sound. Planes, wave upon wave of them, coming in and down on Center from the southwest—from toward the Gulf of California. They were coming as fast as their jets could send them; almost as fast as the sound that preceded them. The first wave parted in definite formations as it came in, part of it dissolving to strike at the six anti-aircraft gun positions that surrounded Center and the main body coming in on Center, itself.

"What is it?" June was beside him with her hand on his arm. "They couldn't be *ours*—"

"No," he said tonelessly, "they're not ours."

They stood and watched—there was nothing else they could do. The first wave passed low above them with a deafening, ground-shaking roar and was gone in the space of two breaths. The bombs shot downward in fast, flat arcs and their explosions raced through the city at the speed of the planes that had dropped them; red and yellow spurts of flame that leaped upward and hurled strange, broken things into the air, to be silhouetted momentarily against the pale dawn.

The second wave came close behind the first; a roar that swelled into a crescendo then boomed into the distance with the bomb bursts a thunderous staccato racing along on the ground behind them. Then the anti-aircraft guns came to life, licking thin, defiant tongues of flame at the invaders. The third wave concentrated on the gun positions and some of them plunged to earth, trailing black plumes of smoke, but three of the guns were still when the others had passed on.

For a few seconds Center was almost quiet by contrast to the thunder and fury that had filled it and a dog could be heard somewhere among the wreckage, barking and whining anxiously as it ran back and forth in a vain search for its master. A woman screamed, a sound that cut through the morning air like a thin, sharp knife, then the alarm siren began to moan and wail, half drowning the sound of cold motors breaking into

life and the shouted orders of men.

The next attack on Center was a wave of fighters, boring in on the machine-gun towers in the Computer and laboratory area. The machine guns in the towers met their fire and tracer bullets were golden lances that met and crossed and struck the towers, to ricochet away in beautiful parabolic curves. Two of the attacking planes wavered and spun to the ground, but when the others turned to renew the attack there were no guns left to oppose them.

They began to strafe the streets and the cars that were trying to make their way through the debris, patrolling the area around Lab 4 and concentrating vicious fire on any vehicle that attempted to go in that direction. They had not bombed the laboratory area or the adjacent landing strip, and Knight realized, as he watched them, that there could be but one reason.

Russo-Asia had planned for this day for a long time. They had planned well; so well that even America's own Intelligence agents had thought the talks of peace were sincere. They had stressed the desirability of friendship between East and West and the West had hoped, and half-believed, and let themselves be caught unawares and unprepared. The anonymous phone call implicating Connie had been only a touch to add weight to the evidence against Miles; the evidence that had resulted in the postponement of the

ship's flight and had insured that neither Miles nor anyone else would be inside the ship and in position to prevent its seizure when the attack came.

It had all been done with exact and detailed precision; the timing of the robot's phone call to Security, the attack in the early dawn before Clarke or Vickson had time to appear—or was Vickson their agent, and already inside the ship?

He would have to move fast—if it wasn't already too late.

He swung the door wide and thrust June into the car. "Get behind that wheel and drive like hell back to where Connie is. If a plane comes at you, jump and run—don't stay in the car or they'll get you. I'll have to try to get to the ship—"

A plane roared over them and its tracers made a bright splash of yellow phosphorescence on the pavement beside them. The tires of an army truck screamed at the intersection a hundred feet behind them and June, watching, cried, "Connie!"

Connie was coming toward them across the intersection, trying to run as best she could, and the army truck was braking and slewing desperately to avoid hitting her. Then the plane banked and turned and came roaring back at them and June half sobbed a terrified "*No!*" as its tracers licked down at the truck and across it, to lash at Connie who had reached the

curb. She crumpled to the walk and the plane went its way, while the army truck wandered aimlessly down the street with the dead driver slumped over the wheel.

"*No!*" June shoved past him, her face white with fear, and ran to her sister. He followed, sick at heart with the foreknowledge of what he would see.

Connie was lying very still, her face like that of a pale, waxen doll that had gone to sleep. June was kneeling beside her, holding her hand and saying over and over in a dazed voice: "Connie . . . Connie . . . why did you do it?"

"She had to," he said softly. "She was going to you because you might need her. She was a nurse and she was going to you and Tim and all those who might be hurt and in need of her."

The siren whimpered off into silence and the bark of one lone antiaircraft gun came to them, to falter and stop as another attack of bombers roared over it.

"They killed her!" June's voice was numb with the shock. She held Connie's hand between both her own, a bright red splotch on her knee where it touched Connie's side as she knelt beside her. "They killed her—they killed my sister!"

She raised her face to look at the planes circling above them and a terrible, savage hatred blazed through the hurt and pain in her eyes.

Then the tears, that the first shock had held back, came and he hurried quietly away, leaving her crying with shaking, muffled sobs beside her sister. There was nothing he could do to comfort her and it would be better for her to not follow him.

He ran in a steady trot, two blocks to the highway that paralleled the western boundary of the laboratory area, then down along it. Trees had been transplanted beside the highway in years past and he kept under the shelter of their concealment as he ran. He stopped once, to dart out on the pavement where a jeep lay overturned and riddled with machine-gun bullets. The B.A.R. man was sprawled lifelessly beside it, his heavy automatic rifle still in his hands. Knight seized the rifle and the belt of cartridge clips and ran back to the shelter of the trees as a plane spotted him. Its bullets cut twigs from the limbs above him and made a *thunk-thunk* sound as they buried themselves in the trunk of the tree. Then the plane was gone and he ran on toward the western entrance that was the closest to Lab 4.

The fighter planes widened in their circling to leave a clear space above the laboratory area as he reached the gate, then the troop-transport planes came in—six of them. The sky blossomed with chutes, the Russo-Asian paratroopers firing even as they descended. Other rifles were firing from within Center and from the area outside the main gate, and occasionally a

paratrooper would jerk, than dangle limply in his harness as he drifted downward.

The last group of planes came in; a light, fast bomber surrounded by a protecting ring of fighters. The objective of the light bomber, he saw, was the landing strip nearest to Lab 4.

The bomber's mission would not be to bomb the landing strip, and there could be no doubt as to the identity of the passenger it carried. It slowed and dropped to make its landing and he began to run toward the ground-control station and Lab 4 that set two hundred feet beyond it.

He was protected from the fighter planes by their own paratroopers and the aim of the paratroopers, shooting from their swinging suspensions, was uncertain as they tried to catch his running, weaving figure in their sights. Bullets kicked up puffs of dust beside and behind him but none touched him. He had reached the ground-control station when the first paratrooper reached the ground. The vicious rip of a burst of well-aimed bullets slammed against the steel corner of the building a split-second after he had rounded it. Two more paratroopers landed even as he ran for the door of the station, adding their fire to their comrade's. It was two hundred feet to the ship and, now that they were on the ground, the aim of the paratroopers would be deadly and certain. He would never live to run a tenth of the distance to the ship. And

the others were landing, by three's and four's.

But it didn't matter—he would be in supreme control of the ship from the auxiliary station.

The guards were lying before the door of the station, dead, and the door was ajar. Simultaneously, he saw the other thing that was happening; the roof of Lab 4 was sliding back and the walls were dropping into the ground. He leaped through the doorway and to one side as paratrooper bullets hammered at him, the automatic rifle held ready before him.

The room was deserted but for the robot, George. George turned away quickly from the control panel at the far end of the room, and Knight saw the switch was on that lowered the walls of Lab 4.

"Turn that switch off!" he commanded. "Raise those walls again."

The robot stepped toward him with long, swift strides, seeming not to hear him. The metal arms were half outstretched before it and a sudden, icy premonition ran a cold finger up his spine.

"Stop!"

It came on without slackening its speed, the dark eyes thoughtful and the steel hands reaching out toward him—hands that had the strength to tear his head from his body.

"Stop!"

The steel hands swooped toward his throat and he leaped to one side. It

spun with him, as quick as he for all its ponderous bulk, and then it sprang like a great cat.

There was no time to wonder why the robot wanted to kill him, no time to dodge. The rifle was still leveled before him and he pressed the trigger. The great mass of the robot lurched and shuddered as twenty bullets, each with a muzzle energy of three thousand foot pounds, tore through its body within a space of two seconds. It reeled and crashed to the floor, to lay inert while the dark eyes stared up at him with their same expression of thoughtful, patient waiting.

But it was dead. Its brain was a riddled wreckage and it was as dead as ever a robot could be.

He ran to the control board and slapped the switch that would re-erect the walls and roof of Lab 4, wondering why the robot had tried to kill him. A machine has no volition, yet it had walked toward him with the deliberate intent to kill him, heedless of his command for it to stop. It might as well have been deaf—

Of course! It *had* been deaf! It had been sent recently from Lab 4 with orders to lower Lab 4 into the ground and to kill anyone who entered the ground-control station. Then, after the orders were given, the microphones that were its ears had been disconnected and it had gone on its mission, stone-deaf and unable to hear any orders that would countermand the ones given it.

He hurried back to the door, slipping a fresh clip of cartridges into the rifle as he went. He opened it a quick, cautious ten inches and saw that the paratroopers were taking up positions in a wide circle around the ship. Two of them saw the partial opening of the door and he had time only for one quick glance before their bullets pounded against it as he slammed it shut.

He had had time to see the ship, standing bright and naked in the first rays of the sun. The walls that had enclosed it had disappeared. The air lock of the ship had been open and a man had been standing there, the rising sun red on his face—Vickson. He had been looking toward the landing strip and a car racing toward the ship—a car whose dust trail led back to the light bomber.

He locked the door to prevent anyone entering the station, while the bullets hammering methodically against the outside of it informed him that they were seeing to it that no one left it. He went back to the control board and looked at the switch that he had closed before going to the door; the switch that should have re-erected Lab 4 around the ship. It had not, and he saw the reason why; George had ripped out the wires behind the panel that led to the switch. They were lying tangled on the floor behind the panel and he could never, in the short time he had, reconnect them.

He seated himself in the chair before the control board and turned on the observer's viewscreen. His own viewscreen came to life, showing the interior of the ship's control room. It was still empty.

He closed the switch that would give his own commands precedence over any given inside the ship and said: "Ship's drive control—disregard all orders given you by anyone in the ship's control room. Disregard all impulses from the pilot's control panel."

Only silence answered him and he said sharply, with sudden anxiety, "Ship's drive control—acknowledge that order!"

Silence.

He tried again, coldly, unpleasantly certain that it would be in vain. "Ship's drive control—*acknowledge!*"

Again the dead silence was his answer and he knew there was no use to try any more. The units that permitted the ground-control station to control the ship had been sabotaged and he was helpless to prevent the ship's take-off. Bullets continued to rattle against the door, warning him how fatal would be any attempt to leave the station. He was helpless so long as he remained in the station; he would be both helpless and dead a split-second after he opened the door to leave the station. Yet, he had to do *something*.

He estimated the time that had gone by since he had seen the car

speeding from the bomber to the ship. It would have been Cullin, of course; it would be Cullin and Vickson who took the ship into the sky, with Vickson at the pilot's seat and Cullin behind him, watching him. Vickson knew as well as Miles how to operate the manual drive controls, and there was no hope that he would make a mistake and wreck the ship in the take-off. Even Cullin, alone, could lift the ship by simple voice command to the drive control. The Center forces would be closing in on the ship as the fighter planes exhausted the ammunition they were forced to use so continually, but they would be too late.

A sound broke the silence of the observer's viewscreen, the sound of someone entering the control room. It was Cullin, wearing the black and gray uniform of a high official of the Socialist State Police, and he was alone. He took one quick look at the room, then walked straight to the observer's chair in the manner of a man who knew exactly what he was going to do.

At the sight of Knight's face in the observer's viewscreen he smiled in sudden, pleased surprise. Knight spoke the same greeting he had spoken at Punta Azul: "Going somewhere, Cullin?"

Cullin seated himself in the observer's chair, still smiling and taking his time about answering. "Why, yes," he said, "I *am* going somewhere.

Vickson was telling me you were in there, but I was afraid you had been rendered permanently speechless by your faithful George." Cullin shifted his eyes to look past Knight at the robot lying on the floor across the room. "I see you had sufficient intelligence to destroy the robot before it destroyed you. It was very useful to me—via Vickson's orders to it—but it's just as well that it failed to carry out its last order; to throttle anyone who entered the station. You and I can now chat pleasantly about cabbages and kings and sealing wax and a man named Cullin who is, as you feared, going somewhere."

"Alone?" Knight asked. "Where's Vickson?"

"Outside. He was rather surprised that he couldn't go with me."

"He is a pilot as well as observer—why don't you take him along?"

"You builders of this ship thoughtfully gave it a robotic brain for the drive that makes the pilot's manual controls unnecessary. Whoever controls this ship can write his own ticket, so I'll take it up alone and there'll be no danger of a doublecross, no doubt as to who will write the ticket."

Cullin reached out and turned the red knob to the right. "No pilot is needed," he said. "You've made the ship foolproof."

"How did you manage to keep Vickson from taking the ship up before you ever got to it?"

"He was selected, Knight, years

ago. For all his passing of the tests for superior mental stability, Vickson is a man who places a very high value on his own life. Of all the men who had full access to the ship, Vickson was the best suited to our purpose. There are various ways of persuading various types of men and compelling them to co-operate. With Vickson it was very easy and simple—we used the *y* drug.

"Perhaps you've heard rumors of it. Our own scientists whipped it up for us several years ago, and it's very efficient. Thirty days after the administration of the drug the subject is stricken with intense pain. This pain increases by the hour and only the antidote, made from a batch of the original drug, can stop the increasing pain and eventual death. We have occasionally let Vickson wait a few hours extra just to keep him convinced of the desirability of wholehearted co-operation with us. Had he been foolish enough to take the ship he would have died in a great deal of agony within six hours, since everything was timed very carefully, including the last administration of the *y* drug."

"And what becomes of Vickson now?"

"I wouldn't know," Cullin shrugged, his shoulders with disinterest. "He's served his purpose for me—I have no further use for him."

"And no antidote for him?"

"I rather doubt that the good citizens of what is left of Center will

permit him to suffer very long."

No, thought Knight, they won't, but it was Cullin who had planned it, coldly, deliberately—

"I've planned this for a long time," Cullin said, as though he had been reading Knight's mind. "All my life I've played second-fiddle to someone else. Now, the world will dance to *my* tune."

Knight looked at him sharply and Cullin laughed with genuine mirth. "No, I'm not insane. This ship is my whip; I'll use the threat of it to whip the world into two billion gentle, obedient horses."

"Obedience seems to be a mania with you."

"It produces the desired results. That's why I liked your robot; no threats were necessary, no y drugs. It accepted orders without question and carried them out without question."

The bullets were no longer banging against the door, Knight noticed. That would mean that the Center forces had gathered in strength and had drawn in closer; that the paratroopers had no time to spare for watching the door. Cullin liked the unquestioning obedience of a robot and he, Knight, could not keep him from giving the order to the drive control that would lift the ship. The robotic brain that was the drive control would obey instantly and without question, but if Cullin should not word his command in the proper manner—

"Once more I'm leaving you. Listen while I give the order to your own ship."

Cullin smiled once more, triumphant and exultant, and gave the order: "Ship's drive control—accelerate!"

It was the command Knight had hoped he would give. It was a command the robotic brain would obey instantly and Cullin could never countermand.

It required slightly less than three seconds for the primary activation of the ship's drive, then the thrust of acceleration came and the ship hurled itself upward. Cullin was shoved deep into the cushioned seat by it, pinned and chained by it. He tried vainly to speak, the horror of sudden realization and fear in his eyes, then the blankness of unconsciousness clouded them. Knight turned away from the view-screen. Cullin would be conscious when he returned to it later in the day. Cullin would not die for a long, long time—the doctor in the control room was very competent.

He went to the door and stepped outside. The ship was gone, already beyond sight, and the last of the paratroopers were throwing down their guns and surrendering to the Center forces that surrounded them. The planes were gone; back to carriers somewhere in the Pacific, he presumed, there to depend upon the threat of the disintegrator rays to

shield them and the carriers from retaliation.

But there would be no war. Russo-Asia had put all her eggs in one basket and one wrong word had sent that basket away forever.

Someone was lying near Lab 4; motionless on the ground, his rimless glasses knocked askew by the bullet that had killed him and looking mild and apologetic, even in death. Knight felt a sense of relief. Vickson had paid the penalty and it had been gentle compared with the penalty Cullin would pay. It was as it should be.

"Blacky."

June was coming toward him, a cartridge belt sagging from her waist and a rifle in her hands.

"We've lost, haven't we?" she asked, stopping before him. "They took the ship and we couldn't stop them."

"The ship will never come back," he said. He looked down at her, her grimy hands clutching the rifle, her clothes torn and her face scratched and dirty and tear-streaked. He saw that most of the clips were gone from the cartridge belt.

"They got Tim," she said. "They must have killed him in the first bombing. I ought to go back and try to help—there are so many people in need of help and it's what Connie would want me to do. But first"—she looked up at him, tears suddenly threatening to wash a new channel through the dirt on her face—"can't

we take her—home?"

He took the rifle she still held and let his hand rest on her shoulder.

"First, we'll take Connie home."

The doctor's pre-flight training had included the order to keep the pilot informed of each man's physical condition.

How long had it been since the doctor last changed the words on the pilot's communications panel? Was his time finally within short minutes of its end? It was no longer hours, but minutes. The words read: OBSERVER HAS A LIFE EXPECTANCY OF ONE HOUR AT PRESENT ACCELERATION. DEATH FOR OBSERVER WILL RESULT UNLESS ACCELERATION IS REDUCED WITHIN THAT PERIOD.

How many days and weeks had gone by since he had first given the fatal command to the drive control? It had been Vickson who had done the thing that would so soon culminate in his death. Vickson, the mild and apologetic. Vickson had feared that he would be deemed dispensable, and this had been his means of revenge. Vickson had told him how to word the command to the drive control: "Ship's drive control—accelerate!"

Vickson had known that the robotic drive control would continue to accelerate until full acceleration was reached. Vickson had known full acceleration would be maintained until he ordered it reduced. Vickson had known that the first surge of acceleration would render

him speechless and unconscious. Vickson had known that the robot doctor in the control room would do the only thing possible to save his life while under full acceleration: by-pass his heart with a mechanical heart, and put it in conjunction with a mechanical lung that frothed and aerated his blood. Vickson had known he would live a long time that way, with the doctor watching over him and administering nutrients into his bloodstream. Nutrients—and the antihysteria drug that had been designed to keep the observer's mind clear and logical so that he could meet any emergency!

How long had it been since the view-screen shifted into the red and then turned black as the ship exceeded the speed of light?

They had watched him until the ship's speed had become too great. Knight, and others he did not know. He had tried to appeal to them to do something; pleading mutely, with all the power of his terrified mind. They had done nothing—what could they do? The robot had been ordered to destroy the units that enabled the ground-control station to control the ship, and machines did not make mistakes when carrying out orders.

Knight had spoken to him once: "You wanted obedience, Cullin—now you have it. You climbed a long way up by forcing human beings to behave like machines. But you were wrong in one respect; no human can ever be forced to behave exactly like a machine, and no machine can ever be constructed that

will behave exactly like a human. Machines are the servants of humans, not their equals. There will always be a gulf between Flesh and Steel. Read those five words on the panel before you and you will understand."

How many minutes did he have left? The doctor knew he wanted to live, and it knew it had only to reduce the acceleration to save his life. It was intelligent and it knew what he wanted, but it was obedient and it was waiting to be ordered to reduce the acceleration.

It was watching him, waiting for him to give the order, and it knew he could not speak without lungs!

Once he had wanted obedience, without question, without initiative of thought. Now, he had it. Now he understood what Knight had meant. The full, bitter lesson was in the five words on the panel before him, and he was trying to laugh without lungs when he died, his eyes fixed on it and his lips drawn back in a grim travesty of a smile.

It was a good ship, built to travel almost forever, and it hurled itself on through the galaxy at full acceleration; on and on until the galaxy was a great pinwheel of white fire behind it and there was nothing before it.

On and on, faster and faster, into the black void of Nothing; without reason or purpose while a dark-eyed robot stared at a skeleton that was grinning mirthlessly at a five-word sentence:

A MACHINE DOES NOT CARE.
THE END

THE TEST

BY RALPH WILLIAMS

*It isn't that an authoritarian attitude is inherently wrong
—it's just inappropriate when it's in the wrong place.*

Illustrated by Fred Kirberger



The first day in the compounds, the refugees were bathed, deloused, fed, and segregated by sex and language groups—after two years of a war that had swept back and forth across Middle Europe, ethnographic boundaries had ceased to exist. Germans and Croats, Letts and Serbs, French and Poles all mingled in fine confusion; enslaved and displaced by one army; liberated and displaced by the next.

Otto was put in a small wooden hut with seventeen other men of his cover nationality.

The second day, they were questioned. An unarmed American corporal—sad experience had taught even the Amis not to carry weapons into the compounds unless they intended to use them—escorted Otto to a small room where a thin-faced lieutenant sat behind a battered desk surrounded by filing cabinets improvised from empty packing cases.

The lieutenant was German but wore the insignia of an American unit. This was not unusual in the second year of the war, when a German was as likely to be found in an American unit of the UN forces as a Texan was to be found in a New York National Guard unit. The original reality of distinct national forces had largely degenerated into an administrative convenience.

The Intelligence officer was polite but not cordial. He took Otto's name, age, and occupation—chemical engineer, Otto's superiors had chosen it

very carefully for a specific purpose—and questioned him briefly as to political background. He showed some interest as Otto outlined his activities in the underground, but was blankly unresponsive to the passwords Otto slipped in casually as authenticators. Quite correct, Otto thought approvingly. If the Intelligence officer recognized the passwords, they served their purpose. To respond to them would needlessly compromise their security.

After the questioning, the corporal led Otto back to his barracks and went off with another refugee. Otto sat on his bunk and covertly studied the other men in the hut. A poor looking bunch, hopeless, beaten men, bludgeoned by war into dull fatalistic acceptance, ragged and gaunt. Still, one could never tell. He probably did not make too impressive an appearance himself, Otto thought. He unobtrusively made a recognition symbol, the one used by active guerillas. One man answered. Otto waited ten minutes and then strolled idly to the door. Presently the other man brushed past him, going to the water hydrant which served the compound. Otto watched for a moment and then slowly walked over to join him.

"What band?" the guerilla asked.

"Vogel's," Otto answered. He did not feel it necessary to elaborate. Actually, his time with Vogel had been long before, he was on much more important assignments now.

"And you?" he asked.

"Stahlgesetz." The man grinned unpleasantly. The Stahlgesetz were given to certain drastic modes of protest which the more moderate official Resistance frowned upon as unnecessarily provocative of the totalitarian masters. "Just now, I am by myself. Our band was wiped out. We had had some fun with three of their officers we caught, and they were very upset. So they dropped an Atomiker on our little camp. Expensive, but effective. I was away at the time, luckily. I stayed away, my brother-in-law hid me till the Amis came. You have been questioned already?"

Otto nodded.

The Stahlgesetz sucked reflectively at the tin cup of water. He had no teeth and no fingernails. "We are lucky we were picked up by the Amis," he said. "They are very efficient. Already they are screening us. In another week we shall be fighting again."

Otto nodded again. His plans did not include joining the Free Europe units of the UN forces, but he saw no reason to say so. The Stahlgesetz was a blabbermouth, probably good enough as a fighter, but no man to confide in. In any case, the conversation had served its purpose, he had made contact with a man who might later prove useful; the more useful perhaps for his tendency to gossip, if properly exploited; and there was no need to prolong it.

Otto turned casually away.

The Stahlgesetz went back to the hut and Otto strolled over toward the compound fence, studying the American sentry on the other side. Warm clothing, automatic carbine, body armor—What *we* couldn't do with that, Otto thought with sudden envy. He smiled at the sentry.

"Do you have a cigarette?" he asked in English. To ask for some small gift was always good tactics with the Amis, it made them feel big.

The sentry eyed him stonily. "Back from the fence, buster," he said. "Three yards back."

Otto felt his smile turn rancid in his mouth. "Sorry," he said politely. He walked back toward the hut. They're so superior now, he thought, but just wait, just wait—

That afternoon another lieutenant, an American this time, came to the hut followed by a sergeant with a handful of mimeographed papers. The lieutenant swept the refugees with a bored superficial glance.

"Eighteen in this hut?" he asked.

"That's right, sir," the sergeant said.

The lieutenant turned again to the refugees, who were watching him with silent wariness.

"Attention," he said in their own tongue, speaking with good enough grammar but a poor accent. "In order to avoid unnecessary hardship and make the most effective use of friendly personnel, United Nations forces have

been directed by the Secretary-General to screen displaced persons as rapidly as possible and release them for useful occupation, if they so desire. Are there any here who do not wish to serve with the United Nations?" No one moved or spoke. "I have here a simple Intelligence test," he continued, "which I would like you to fill out as a preliminary step in assessing the kind of work best suited to your ability and temperament. The sergeant will pass these around to you. Please mark each question you are able to answer. If you are in doubt, leave the question blank. Are there any here who cannot read or write?"

Five men raised hesitant hands. The lieutenant motioned them over to him. "Sit down there," he said, indicating a bench along the wall. The sergeant gave each of the remaining men one of the mimeographed sheets. Otto took his and walked over to the lieutenant.

"Please," he said in English in a confidential tone, "I am an engineer, a chemist, well-educated. This test is, for me, a waste of time."

The lieutenant shrugged. "You don't have to fill it out, if you don't want to," he said indifferently. "Just put your name on the sheet and leave it blank."

"I see," Otto said. He juggled the paper thoughtfully, studying the American's noncommittal face. "Sorry." He smiled deprecatingly, "I thought perhaps we might save

some time; cut the, uh, red tape." He went back to his bunk and sat down.

"Test 43b," the paper was headed. "Preliminary Screening. Write your name clearly in the space provided." Otto wrote his cover name in a firm neat hand. "The purpose of this test," he read, "is to measure your common sense, your native ability to distinguish between sense and nonsense. Below are forty statements. Study each one carefully. If you agree, put a 'plus' sign in the blank space to the left of the statement. If you disagree, put a 'minus' sign in this space. If you have no opinion, leave the space blank. Show strong agreement or disagreement by the figure '3,' moderate by '2,' slight by '1.'"

Otto looked around. The other men were bent over their papers, studying them frowningly or writing with careful deliberation. The sergeant had pulled a comic book from his pocket and was slouched on one of the bunks reading it. The lieutenant had gone to a window and was leaning on the sill, staring gloomily out across the compound.

Otto read the first statement:

"Obedience and respect for authority are the most important virtues children should learn." Of course, he thought, the test must be quite simple to suit the mentalities of people like these other cattle, the Amis were really quite shrewd. He marked a firm "plus three" in the left margin. He went rapidly down the list:

"An insult to our honor should always be punished." Plus three, of course— "Some cases of feeble-mindedness are caused by overstudy." Plus three—

He finished the paper and laid it on the bunk beside the sergeant. The sergeant did not look up from his comic book.

The last man completed the test and laid his paper gently on the bunk by the oblivious sergeant. For a while they sat silent, all eyes on the lieutenant, who still stared out the window. Finally the Stahlgesetz cleared his throat raucously. "Mr. Officer," he said loudly. The lieutenant looked around and saw that they were finished. He spoke to the sergeant who picked up the papers and counted them and compared the names with a list.

"Attention," the lieutenant said. "There is one more test for you to take, a short one." The sergeant distributed more mimeographed papers from his supply.

A simple standard Intelligence test, Otto saw. He had seen dozens like it. He wondered why it was necessary for them to take two tests—possibly for cross-checking. The Amis were great for cross-checking, check, double-check, check your double-check, they did not even trust themselves. Otto filled the questions out absent-mindedly, there was nothing to really catch his attention in them, as there had been in the first test. He took the pa-

per to the sergeant and went back to sit quietly on his bunk, thinking about his mission.

When all had finished the two Americans counted the sheets again and went away, taking the five illiterates with them. There were similar tests for illiterates, Otto vaguely surmised, which would of necessity be given orally and in private.

The captain in command of the refugee camp psychometric section was in civil life a successful psychoanalyst, and considered that he was wasting his talents in this assignment. True, he had asked for it, his imagination had been caught by the tidy theoretical background of the Sanford-Levinson techniques, and for a time he had kept meticulous notes, introduced carefully reasoned variations, toward the monograph he envisioned sometime after the war. The Jones-Sanford-Levinson technique, he sometimes daydreamed it might come to be called.

This virgin enthusiasm had long since departed. It was not so much that the people he dealt with were so uniformly psychotic, they were psychotic in such drearily uninteresting ways. In late twentieth century Europe, Eros played a poor third to starvation and fear. Now in his civilian practice, Captain Jones thought—

The lieutenant came in with a sheaf of papers.

"Preliminary screening on Hut 9,"

he said. He laid them on the captain's desk.

The captain yawned and shuffled the papers. One F6, three F5, one F1, the rest clustered around the center. He flipped the F1 over and looked at the abstract from the man's first interview clipped to the back.

"Stahlgesetz, eh?" he said. "Turn him over to that Free Europe liaison officer; they want those boys." He stapled a blue tag to the paper.

He picked out the F6 and laid it aside, leafed rapidly through the rest. "Um-m-m," he said, "standard negative correlation with IQ, no anomalies. Run 'em through the mill." He clipped a yellow tag to the bundle and picked up the form he had laid aside, frowning thoughtfully.

"How about this one, now?" he said. "Resistance fighter, chemical engineer, he says. Intelligence notes he gave correct Resistance passwords, made a good impression. Notice anything about him when you gave the tests?"

The lieutenant had been looking out the window again, he spent much of his time looking out windows at nothing. He brought his attention back to the captain. "Let's see," he said. He took the paper and studied the name. It meant nothing to him, he did not associate it with any face, and he had forgotten Otto's initial reluctance, those who knew English were always seizing opportunities to show it off. The lieutenant shook his head and

handed the paper back.

"I see," the captain said. He pursed his lips thoughtfully and sighed. A few months ago, this case would have been interesting. Now it simply meant more work. He clipped a red tag to the paper and handed it back to the lieutenant. "Process him through phase B and C," the captain said.

The next morning Otto and the Stahlgesetz were removed from the hut. Otto was taken to another compound and put in a room by himself, in a larger building which might have been some sort of dispensary or hospital. He was not sure if this was good or bad, and he comported himself alertly and circumspectly, but with the outward appearance of confidence, as behooved any prudent man in the face of uncertainty.

Presently the lieutenant who had given the tests came in. The lieutenant studied Otto with some interest, remembering him now, and recalling that this one spoke English.

"Good morning," he said in that language. "I have some more questions for you."

Otto smiled. "Good morning," he said. So, he thought, only more psychological questions. The tests yesterday must have turned out well, he thought, the Ami is more friendly today, he sees me now as an individual. He watched the lieutenant slip some printed matter from a folder which also contained a few sheets stapled

together with a red tag. The papers the lieutenant removed were printed in the language of Otto's cover nationality.

"I can take the tests in English, if it would be more convenient," Otto offered politely. "I am quite fluent." That always flatters them, he thought, they like to think of it as a universal tongue.

"The tests will be given in your own language," the lieutenant said, switching from English. "For effectiveness, the subject must be able to think fluently in the language, he cannot develop his ideas as fully in any other than his native speech."

"As you wish," Otto said. He did not mention that the language they were speaking was not his native speech. Actually, it made little difference, he spoke and thought fluently in several tongues, including English.

"Now," the lieutenant said, "I want you to answer the questions I am going to ask you frankly and freely, this is for a serious purpose, I do not wish to pry into your personal feelings, but it is necessary that we know these things before we can properly place you.

"First, you know there are times for all of us when we do not feel as well satisfied with life, as pleased with ourselves and others, as we do at other times. What moods or feelings are the most unpleasant or disturbing to you?"

"None," Otto replied promptly.

"I do not have disturbing moods. Moods are for weaklings."

"Yes, I see," the lieutenant said. He doodled aimlessly on the pad before him. "Well, still, there must be some times when you feel upset in small ways. Can't you remember any such times, what caused them? I have to put *something* down." He smiled ingratiatingly.

Well, Otto thought, if it makes the poor Ami feel so bad—

He thought carefully. "When things do not work out according to plan," he said slowly, "that is upsetting, a competent man can always devise a new plan, but it sometimes disturbs one. Is that what you mean?"

"That's very good," the lieutenant applauded. "Are there any other things?"

"Immorality, I suppose. To see men and women behaving like pigs."

"Fine," the lieutenant said, writing rapidly on a pad. "Now, the next question—"

"On the projective questions," the lieutenant told the captain, "we get an almost classical response. Reluctance, threatening environment, violations of convention; reluctance, nonfocal aggression, impersonal sex—checks right down the line. Also some very significant minor themes which don't appear in the scoring. I've underlined those. You want to take the interview?"

"No, you do it," the captain said

hastily. "I've got some reports to clear up."

"O.K." The lieutenant gathered the papers and slid them back into the file folder. "I'll get on it right after lunch."

The German Intelligence lieutenant and the American psychometrist sat next to each other at lunch.

"This Otto Something," the Intelligence officer said, "the chemical engineer. You will have him cleared soon? If possible, I would like to have another talk with him before he leaves."

"Something fishy?"

"No, no," the German said hastily. "Quite the contrary. I have been following some leads which developed in the first interview, he seems amazingly well acquainted in the Resistance, apparently acted as some sort of courier, and I wish to confirm certain points with him. We do not have too clear a picture of underground operations in enemy territory, anything we are able to get along those lines is quite helpful."

"I see," the psychometrist said. "Well, I don't think he'll be leaving right away, you'll probably get him again. Maybe you could get the things you need from him during your regular interrogation."

The Intelligence man looked shocked. "You mean—?"

The psychometrist nodded. "Looks that way. We've got a red tag on him

now. I think it'll be black tomorrow."

Otto finished his lunch, stacking the carefully cleaned dishes neatly on the tray and setting the tray on the floor by the door, squared precisely. He lit one of the cigarettes that had been brought with the meal and sat comfortably on the bunk smoking.

Things seemed to be working out quite well. Ordinarily, he would not have liked it at all. Specific attention of any kind, even favorable, violated his deepest instincts as a seasoned Intelligence operative. But in this particular case, the whole success of his mission depended on his not being set to digging ditches with the mass of illiterate refugees. Months of preparation and training had gone to aim him directly for a specific point in the organizational structure of the United Nations war effort. His whole cover background, down to the minutiae of notes and letters published in technical journals ten years old, had been selected to fit him perfectly to the needs of the exact position his superiors wished him to occupy. And the whole painstaking effort would be in vain if he was unable to attract enough attention, in the impersonal ruck of refugees, to insure that the background *was* checked, that the UN high command realized what a pearl of price they had netted.

Otto smiled wryly to himself, thinking of the various stratagems he had

so carefully planned, the hooks he had planted in his interview with the Intelligence officer, his little 'by-play with the American lieutenant the first day, to hurdle this barrier. So unnecessary. In less than three days the psychological machinery of the gadget-mad Americans had effortlessly and almost lackadaisically singled him out from hundreds of brainless cattle.

One had to admire their system, these Amis, however unimpressive one found them personally.

Of course, the danger of such close scrutiny must not be forgotten, the very fact that he was moving so rapidly toward his goal made it doubly wise to remain alert. Undoubtedly, before he got much further, Intelligence would be interested in him again, and this time he would really be put through the wringer. The thought did not frighten him. His cover background was *good*. It would stand up.

That afternoon, the American lieutenant returned again with his folder of papers. This time he also had a small briefcase which he placed unobtrusively by his chair.

"Now," the lieutenant said, "I'd like to talk with you about yourself, about your work and your life as a whole. You seem to be a rather unusual sort of person, if we are going to use your abilities to best advantage, we will need to know much more about you." He fiddled absently with

the catch of the briefcase.

So, Otto thought, a recording machine. How childish.

"What, particularly, would you be interested in?" he asked pleasantly.

"I notice," the lieutenant said, "that your former occupation is shown as chemical engineer. That must be very interesting work. Did you find it so?"

". . . Typical authoritarian syndrome," the captain remarked to the lieutenant, scanning the abstract of the interview. "Well, what do you know! Real honest-to-God Oedipus theme, too. Most of these people don't even know who their fathers were, much less give a damn about them one way or another."

He stacked the abstract with the other papers of the file, which by now was quite respectably thick, and drummed nervously on the stack with his fingertips.

"Well," he said reluctantly, "I guess that's it." He ripped the red tag from the file and clipped a black tag in its place, scribbled on the routing slip, and punched a button. A WAC corporal came in and the captain handed her the file. "Take this in to the colonel for review," he said.

"Send him over to Intelligence for questioning in the morning," he told the lieutenant.

The lieutenant brought his eyes back from the window, nodded, and went out.

Otto faced the German Intelligence lieutenant warily, but with outward blandness. So, he thought, now we get down to business. There was no briefcase by this lieutenant's chair, but Otto did not doubt that their conversation was being recorded. He did not hope to catch this one clumsily turning on the machine before his very eyes, this one knew his business. Otto treated him with alert respect, as became a dangerous and intelligent opponent—

"Captain," the colonel said, "Lieutenant Schindler says you've made a mistake on this man. He wants me to blue-tag him, or at least yellow, and turn him over to Intelligence. Says they need him to develop their contacts with the Resistance back of enemy lines."

The captain shook his head. "I'm sorry," he said. "The man is black."

"But, captain," the Intelligence lieutenant protested, "how can that be? I have checked this man thoroughly. He has been active in the Resistance for more than a year. We have positive identification from men who have worked with him, men who have been cleared one hundred per cent by your section. We have identification from his pre-war background, even fingerprints. There must be a mistake."

"There is no mistake," the captain said. "Backgrounds can be faked. Perhaps even fingerprints can be

faked. But personality cannot, at the level which we measure. What we measure are the basic determinants of personality, forces the subject does not even know exist.

"Look here, I'll show you how it works." The captain picked up the interview abstract and flipped through the pages. "Um-m-m, here's a good one, subject's views on international relations. Listen to this: 'One must admire the Falangists for their war effort, but I do not think this admiration for our allies should blind the UN countries, and especially the Americans, to the fact that the Falangists are still basically just as anti-democratic as the enemy. We should accept their help, and in turn aid them to the greatest possible extent against the common enemy, but we should remember that our alliance is based solely on mutual self-interest, it is not necessary that we also love them. The Basque massacres, for example. To question the Falangist explanation at this time would serve no useful purpose, and would not be very tactful, but I think we should keep it well in mind, all the same, as a constant reminder that the tiger has not changed his stripes—'

"That is bad?" the lieutenant asked stiffly. "It seems to me the man makes a quite pertinent point. You will remember, in the last war, the Katyn incident—'

"I'm afraid you don't quite follow me," the captain said patiently. "It

is not the overt content of the subject's statements we are interested in, not *what* he says; it is the attitude behind them, *why* he says it. In this particular case, even at the logical level the statement shows anomalies. For example, 'helping our allies as much as possible,' a speciously pseudo-democratic generality, becomes in the specific instance of the Basque rumors 'doubting our allies.' But that is not really important. In this statement the subject clearly betrays a manipulative way of thinking about others, he assesses the Falangists on the basis of their *utility* to the Allies, rather than on their own merits. This 'practical' way of evaluating people, of seeing them as objects to be 'used,' is one of the most basic authoritarian traits. A true democrat, as this man claims to be, if he honestly believed the Falange to be antidemocratic, would not accept their help or help them, however urgent his need."

"And the man is to be condemned for this, because he is practical?" the lieutenant asked. "I, too, am a practical man. I, too, dislike the Falangists, but am willing to work toward a common end with them. Am I then an authoritarian?"

The captain felt his face redden. "Perhaps so," he said, and immediately regretted it. "Excuse me," he added hastily, "I don't mean to question your loyalty, it's just—" He paused helplessly. How could one convince these psychological illiter-

ates, these soldiers who were "practical" men themselves, who revered common sense and prided themselves on their lack of emotion, their cold-blooded logic?

He turned to the colonel. "Sir," he said formally, "you have my report, which reflects my considered professional opinion. I have nothing to add to it—"

Rather early in the morning of his fifth day in the compound, Otto was awakened by a rap on his door. A sergeant and two armed soldiers stood in the corridor.

"What is this?" Otto asked. "What do you want?"

"You're to come along with us," the sergeant said with a hint of Scottish accent.

So, Otto thought bleakly, now comes the *real* questioning. He knew he had not slipped, but there must have been just enough doubt—Well, he thought, I have been questioned before, by experts. They will get nothing from me. These Amis are too chicken-hearted for real torture. And once I have passed this test, he thought, there will no longer be any question—Good, he thought, his spirits rising somewhat again, a rough job to do, but it must be done. Let us get on with it.

He dressed quickly and neatly.

"I am ready now," he said quietly.

They went down the corridor toward the back of the building and out

a narrow side-door into a little enclosed court. There were more soldiers here, with machine-pistols, and at one end of the court there was a wall of heavy timbers, somewhat splintered at a height about four feet above the ground. In front of this wall there was a sturdy post set solidly in the ground, also splintered in places.

"Wait," Otto said, "you cannot do this! There is a mistake! I am a democrat, a Resistance fighter—"

"No mistake," the sergeant said firmly. "Come along now, don't make a fuss, there's nothing to it, just like yanking a tooth. Grab him, you lads—"

"Look at it this way," the colonel told the Intelligence lieutenant, "a good man, to the enemy, is a bad man to us. These radicals we pick up in the Resistance, like that Stahlgesetz fellow we had the other day, if they were our own people we'd shoot them or lock them up. But fighting, you use what you can get, so we feed them and give them guns and turn them loose again to raise hell with the enemy. On the other hand, the people we kill, the enemy people that is, the good soldiers, are the ones we would want on our own side, if we could get them."

"But still," the lieutenant said, "how can you be sure? This psychological nonsense the captain speaks, does it really mean anything?"

"It means something," the colonel

said. "It works, we've tested it time and again, separates the good sound conservatives from the radicals every time. And when we find a conservative pretending to be a turncoat, here in the front lines, we know he's pretending and we shoot him. But it also has another angle. Now back in the States, some of us are using it to weed out the people at the other end of the scale, the potential subversives in our own ranks. It's a tool, and a good tool, and we know how to use it, and I think when our Captain Jones gets back home he's going to find a few surprises —"

The WAC corporal brought the folder with the black tag in to the captain's desk and stood waiting. She was new and young and eager, and she stood correctly at attention. The captain ripped the black tag from the file and replaced it with a white one, conscious as he did so of the nearness of the girl, catching a faint breath of perfumed soap, certainly not GI. In the blank space after "Final Disposition" he wrote: "exec." and a date and time. He handed her the file.

"File this under 'Action Completed,'" he said. He watched her walk toward the door.

"Miss Smith," he said suddenly, "just a moment."

The girl half-turned and looked at him inquiringly.

"What are you doing this evening, Miss Smith," he asked—

At the bar in the Officers' Club, the American psychometrist studied the German Intelligence lieutenant owl-ishly over his glass. "You take these things too seriously, Karl," he said. "That's the trouble you Germans, always too serious, too earnest, never relax. You hear what I said there? Just said a naughty word, said 'you Germans.' Dead giveaway. Stereotypy, ethnocentrism, ingroup-out-group hostility, who knows what else. Guess I'm just a mean old authoritarian myself. Got it well internalized, though, don't bother me much, only maybe when I have a few drinks."

"But, Robert, explain this to me. I still do not understand. If I am authoritarian, and you are authoritarian, and the colonel is authoritarian, as he most certainly is, then why do we ignore all the objective evidence and shoot Otto because he, too, is authoritarian? Shooting people, that is a thing everyone should be serious about, not make jokes."

"Thought the colonel explained it all to you."

"The colonel is a—" Karl glanced suspiciously at the bartender. "That is, I mean I do not fully accept the colonel's reasoning. It is too pat. I have known some stinkers in the Resistance, but I have also known some very good men, admirable men, I am proud to call my friends. And I am still not sure about this Otto, I cannot help feeling there may have been a mistake."

"No mistake, Karl." The American tilted back his head and drained his glass. "No mistake. That Otto was a bad apple. Tricky, too. Let me fill you in on the background a little—'fill you in,' that's a nice military phrase, colonel'd love that—Let's have another drink, awful dry just talking. Hey, Joe!"

"You are going to get drunk, Robert," the German warned.

"Mean to get drunk. Best medicine in world for clean-cut young American lad, rising industrial personnel man, snatched into Army and hauled half-way around world to associate with Freudians and West Pointers and Military Intelligence analysts—present company always excepted, of course. Ought to try it yourself, boy, give you a better perspective, give you the big picture—'big picture,' 'nother nice military turn of phrase. I'm learning, I'm learning, I'll make it yet."

"What was I talking about? Oh, yeah, Otto. Good old Otto, here's to Otto. Prosit. Thing is, authoritarian in democratic culture is one thing, authoritarian in authoritarian culture, horse of an entirely different culture—hear what I said there? Said 'culture,' meant to say 'color.' Good gag, have to remember that. Think maybe somebody else said it first, though, trouble with smart things a man says when he's drunk, somebody else always gets credit."

"Where was I? Oh, yeah . . . thing

is, catch an authoritarian in an authoritarian culture, claims he's rebel against that culture, obviously lying. Take him out and shoot him. Got nothing to do with whether authoritarians should all be shot or shouldn't all be shot, don't shoot him because he's authoritarian, shoot him because he's enemy agent, trying to infiltrate.

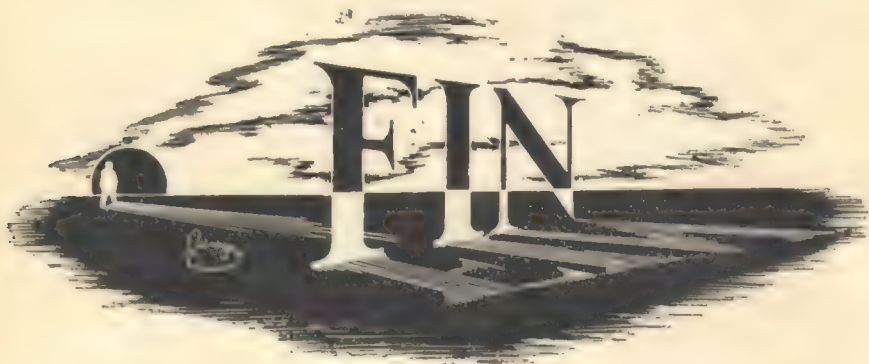
"Catch authoritarian in democratic culture, though, don't mean a thing. Colonel's authoritarian as hell. Good colonel, though. Captain's radical as hell. Good psychoanalyst, though. Nice thing about living in democratic culture, don't always have to be testing people, don't have to tie labels on them, take them out and shoot them. Hard work, shooting people, gives lots of people bad dreams. Democratic culture, you can hate a man's guts for his own sweet sake, don't have to worry about his politics, still work with him. More efficient that way. Colonel had his way, we'd take all the Freudians out and shoot them.

Awful waste, wouldn't have any nice neat little tests to catch spies then. Captain had his way, we'd take all West Pointers out and shoot them, leave us in an awful fix if we had to fight a war. Be shooting people all the time, wouldn't have any time for anything else, no time to eat, no time to make love, no time to get drunk, no time for nothing. You and me, ordinary jerks, we get along with the captain, get along with colonel, gets too much for us, go out and get drunk."

The American squinted at his empty glass. "Hey, getting behind here, can't have that. Hey, Joe!"

The first day in the compounds, the refugees were bathed, deloused, fed, and segregated by sex and language groups. Stanislaus was put in a small wooden hut with fourteen other men of his cover nationality.

The second day, they were questioned—





BELIEF

BY ISAAC ASIMOV

What, I wonder, would be the proper course of action for a professional and accredited physicist—who was afflicted with levitation, willy nilly!

Illustrated by Walt Miller

"Did you ever dream you were flying?" asked Dr. Roger Toomey of his wife.

Jane Toomey looked up. "Certainly!"

Her quick fingers didn't stop their nimble manipulations of the yarn out of which an intricate and quite useless doily was being created. The television set made a muted murmur in the room and the posturings on its screen were, out of long custom, disregarded.

Roger said, "Everyone dreams of

flying at some time or other. It's universal. I've done it many times. That's what worries me."

Jane said, "I don't know what you're getting at, dear. I hate to say so." She counted stitches in an undertone.

"When you think about it, it makes you wonder. It's not really flying that you dream of. You have no wings; at least I never had any. There's no effort involved. You're just floating. That's it. Floating."

"When I fly," said Jane, "I don't remember any of the details. Except once I landed on top of City Hall and hadn't any clothes on. Somehow no one ever seems to pay any attention to you when you're dream-nude. Ever notice that? You're dying of embarrassment but people just pass by."

She pulled at the yarn and the ball tumbled out of the bag and half across the floor. She paid no attention.

Roger shook his head slowly. At the moment, his face was pale and absorbed in doubt. It seemed all angles with its high cheekbones, its long straight nose and the widow's-peak hairline that was growing more pronounced with the years. He was thirty-five.

He said, "Have you ever wondered what makes you dream you're floating?"

"No, I haven't."

Jane Toomey was blond and small. Her prettiness was the fragile kind that does not impose itself upon you

but rather creeps on you unaware. She had the bright blue eyes and pink cheeks of a porcelain doll. She was thirty.

Roger said, "Many dreams are only the mind's interpretation of a stimulus imperfectly understood. The stimuli are forced into a reasonable context in a split second."

Jane said, "What are you talking about, darling?"

Roger said, "Look, I once dreamed I was in a hotel, attending a Physics convention. I was with old friends. Everything seemed quite normal. Suddenly, there was a confusion of shouting and for no reason at all I grew panicky. I ran to the door but it wouldn't open. One by one, my friends disappeared. They had no trouble leaving the room, but I couldn't see how they managed it. I shouted at them and they ignored me.

"It was borne in upon me that the hotel was on fire. I didn't smell smoke. I just knew there was a fire. I ran to the window and I could see a fire escape on the outside of the building. I ran to each window in turn but none led to the fire escape. I was quite alone in the room now. I leaned out the window, calling desperately. No one heard me.

"Then the fire engines were coming, little red smears darting along the streets. I remember that clearly. The alarm bells clanged sharply to clear traffic. I could hear them, louder and

louder till the sound was splitting my skull. I awoke and, of course, the alarm clock was ringing.

"Now I can't have dreamed a long dream designed to arrive at the moment of the alarm-clock ring in a way that builds the alarm neatly into the fabric of the dream. It's much more reasonable to suppose that the dream began at the moment the alarm began and crammed all its sensation of duration into one split second. It was just a hurry-up device of my brain to explain this sudden noise that penetrated the silence."

Jane was frowning now. She put down her crocheting. "Roger! you've been behaving queerly since you got back from the College. You didn't eat much and now this ridiculous conversation. I've never heard you so morbid. What you need is a dose of bicarbonate."

"I need a little more than that," said Roger in a low voice. "Now what starts a floating dream?"

"If you don't mind, let's change the subject."

She rose, and with firm fingers turned up the sound on the television set. A young gentleman with hollow cheeks and a soulful tenor suddenly raised his voice and assured her, dulcetly, of his never-ending love.

Roger turned it down again and stood with his back to the instrument.

"Levitation!" he said. "That's it. There is some way in which human

beings can make themselves float. They have the capacity for it. It's just that they don't know how to use that capacity, — except when they sleep. Then, sometimes, they lift up just a little bit, a tenth of an inch maybe. It wouldn't be enough for anyone to notice even if they were watching, but it would be enough to deliver the proper sensation for the start of a floating-dream."

"Roger, you're delirious. I wish you'd stop. Honestly."

He drove on. "Sometimes we sink down slowly and the sensation is gone. Then again, sometimes the float-control ends suddenly and we drop. Jane, did you ever dream you were falling?"

"Yes; of c —"

You're hanging on the side of a building or you're sitting at the edge of a seat and suddenly you're tumbling. There's the awful shock of falling and you snap awake, your breath gasping, your heart palpitating. You *did* fall. There's no other explanation."

Jane's expression, having passed slowly from bewilderment to concern, dissolved suddenly into sheepish amusement.

"Roger, you *devil*. And you fooled me! Oh, you rat!"

"What?"

"Oh, no. You can't play it out anymore. I know exactly what you're doing. You're making up a plot to a story and you're trying it out on me. I should know better than to listen to

you."

Roger looked startled, even a little confused. He strode to her chair and looked down at her, "No, Jane."

"I don't see why not. You've been talking about writing fiction as long as I've known you. If you've got a plot, you might as well write it down. No use just frightening me with it." Her fingers flew as her spirits rose.

"Jane this is no story."

"But what else—"

"When I woke up this morning, *I dropped to the mattress!*"

He stared at her without blinking. "I dreamed I was flying," he said. "It was clear and distinct. I remember every minute of it. I was lying on my back when I woke up. I was feeling comfortable and quite happy. I just wondered a little why the ceiling looked so queer. I yawned and stretched and *touched* the ceiling. For a minute, I just stared at my arm reaching upward and ending hard against the ceiling.

"Then I turned over. I didn't move a muscle, Jane. I just turned all in one piece because I wanted to. There I was, five feet above the bed. There you were on the bed, sleeping. I was frightened. I didn't know how to get down, but the minute I thought of getting down, I dropped. I dropped slowly. The whole process was under perfect control.

"I stayed in bed fifteen minutes before I dared move. Then I got up, washed, dressed, and went to work."

Jane forced a laugh, "Darling, you had *better* write it up. But that's all right. You've just been working too hard."

"Please! Don't be banal."

"People work too hard, even though to say so is banal. After all, you were just dreaming fifteen minutes longer than you thought you were."

"It wasn't a dream."

"Of course it was. I can't even count the times I've dreamed I awoke and dressed and made breakfast; then really woke up and found it was all to do over again. I've even dreamed I was dreaming, if you see what I mean. It can be awfully confusing."

"Look, Jane. I've come to you with a problem because you're the only one I feel I can come to. Please take me seriously."

Jane's blue eyes opened wide. "Darling! I'm taking you as seriously as I can. You're the Physics professor, not I. Gravitation is what you know about, not I. Would *you* take it seriously if I told you *I* had found myself floating?"

"No. *No!* That's the hell of it. I don't want to believe it, only I've got to. It was no dream, Jane. I tried to tell myself it was. You have no idea how I talked myself into that. By the time I got to class, I was sure it was a dream. You didn't notice anything queer about me at breakfast, did you?"

"Yes, I did, now that I think about it."

"Well, it wasn't very queer or you would have mentioned it. Anyway, I gave my nine o'clock lecture perfectly. By eleven, I had forgotten the whole incident. Then, just after lunch, I needed a book. I needed Page and — Well, the book doesn't matter; I just needed it. It was on an upper shelf, but I could reach it. Jane —"

He stopped.

"Well, go on, Roger."

"Look, did you ever try to pick up something that's just a step away? You bend and automatically take a step toward it as you reach. It's completely involuntary. It's just your body's over-all co-ordination."

"All right. What of it?"

"I reached for the book and automatically took a step upward. On air, Jane! On empty air!"

"I'm going to call Jim Sarle, Roger."

"I'm not sick, damn it."

"I think he ought to talk to you. He's a friend. It won't be a doctor's visit. He'll just talk to you."

"And what good will that do?" Roger's face turned red with sudden anger.

"We'll see. Now sit down, Roger. Please." She walked to the phone.

He cut her off, seizing her wrist. "You don't believe me."

"Oh, Roger."

"You don't."

"I believe you. Of course, I believe you. I just want —"

"Yes. You just want Jim Sarle to talk to me. That's how much you believe me. I'm telling the truth but you want me to talk to a psychiatrist. Look, you don't have to take my word for anything. I can prove this. I can prove I can float."

"I *believe* you."

"Don't be a fool. I know when I'm being humored. Stand still! Now watch me."

He backed away to the middle of the room and without preliminary lifted off the floor. He *dangled*; with the toes of his shoes six empty inches from the carpet.

Jane's eyes and mouth were three round O's. She whispered, "Come down, Roger. Oh, dear heaven, come down."

He drifted down, his feet touching the floor without a sound. "You see?"

"Oh, my. Oh, my."

She stared at him, half-frightened, half-sick.

On the television set, a chesty female sang mutedly that flying high with some guy in the sky was her idea of nothing at all.

Roger Toomey stared into the bedroom's darkness. He whispered, "Jane."

"What?"

"You're not sleeping?"

"No."

"I can't sleep, either. I keep holding

the headboard to make sure I'm . . . you know."

His hand moved restlessly and touched her face. She flinched, jerking away as though he carried an electric charge.

She said, "I'm sorry. I'm a little nervous."

"That's all right. I'm getting out of bed anyway."

"What are you going to do? You've got to sleep."

"Well, I can't, so there's no sense keeping you awake, too."

"Maybe nothing will happen. It doesn't have to happen every night. It didn't happen before last night."

"How do I know? Maybe I just never went up so high. Maybe I just never woke up and caught myself. Anyway, now it's different."

He was sitting up in bed, his legs bent, his arms clasping his knees, his forehead resting on them. He pushed the sheet to one side and rubbed his cheek against the soft flannel of his pajamas.

He said, "It's bound to be different now. My mind's full of it. Once I'm asleep, once I'm not holding myself down consciously, why, up I'll go."

"I don't see why. It must be such an effort."

"That's the point. It isn't."

"But you're fighting gravity, aren't you?"

"I know, but there's still no effort. Look, Jane, if I only *could* understand it, I wouldn't mind so much."

He dangled his feet out of bed and stood up. "I don't want to talk about it."

His wife muttered, "I don't want to, either." She started crying, fighting back the sobs and turning them into strangled moans, which sounded much worse.

Roger said, "I'm sorry, Jane. I'm getting you all wrought-up."

"No, don't touch me. Just . . . just leave me alone."

He took a few uncertain steps away from the bed.

She said, "Where are you going?"

"To the studio couch. Will you help me?"

"How?"

"I want you to tie me down."

"Tie you down?"

"With a couple of ropes. Just loosely, so I can turn if I want to. Do you mind?"

Her bare feet were already seeking her mules on the floor at her side of the bed. "All right," she sighed.

Roger Toomey sat in the small cubbyhole that passed for his office and stared at the pile of examination papers before him. At the moment, he didn't see how he was going to mark them.

He had given five lectures on electricity and magnetism since the first night he had floated. He had gotten through them somehow, though not swimmingly. The students asked ridiculous questions so probably he wasn't

making himself as clear as he once did.

Today he had saved himself a lecture by giving a surprise examination. He didn't bother making one up; just handed out copies of one given several years earlier.

Now he had the answer papers and would have to mark them. Why? Did it matter what they said? Or anyone? Was it so important to know the laws of physics? If it came to that, what were the laws? Were there any, really?

Or was it all just a mass of confusion out of which nothing orderly could ever be extracted? Was the universe, for all its appearance, merely the original chaos, still waiting for the Spirit to move upon the face of its deep?

Insomnia wasn't helping him, either. Even strapped in upon the couch, he slept only fitfully, and then always with dreams.

There was a knock at the door.

Roger cried angrily, "Who's there?"

A pause, and then the uncertain answer. "It's Miss Harroway, Dr. Toomey. I have the letters you dictated."

"Well, come in, come in. Don't just stand there."

The department secretary opened the door a minimum distance and squeezed her lean and unprepossessing body into his office. She had a sheaf of papers in her hand. To each was clipped a yellow carbon and a

stamped, addressed envelope.

Roger was anxious to get rid of her. That was his mistake. He stretched forward to reach the letters as she approached and felt himself leave the chair.

He moved two feet forward, still in sitting position, before he could bring himself down hard, losing his balance and tumbling in the process. It was too late.

It was entirely too late. Miss Harroway dropped the letters in a fluttering handful. She screamed and turned, hitting the door with her shoulder, caroming out into the hall and dashing down the corridor in a clatter of high heels.

Roger rose, rubbing an aching hip. "Damn," he said forcefully.

But he couldn't help seeing her point. He pictured the sight as she must have seen it; a full-grown man, lifting smoothly out of his chair and gliding toward her in a maintained squat.

He picked up the letters and closed his office door. It was quite late in the day; the corridors would be empty; she would probably be quite incoherent. Still — He waited anxiously for the crowd to gather.

Nothing happened. Perhaps she was lying somewhere in a dead faint. Roger felt it a point of honor to seek her out and do what he could for her, but he told his conscience to go to the devil. Until he found out exactly what was wrong with him,

exactly what this wild nightmare of his was all about, he must do nothing to reveal it.

Nothing, that is, more than he had done already.

He leafed through the letters; one to every major theoretical physicist in the country. Home talent was insufficient for this sort of thing.

He wondered if Miss Harroway grasped the contents of the letters. He hoped not. He had couched them deliberately in technical language; more so, perhaps, than was quite necessary. Partly, that was to be discreet; partly, to impress the addressees with the fact that he, Toomey, was a legitimate and capable scientist.

One by one, he put the letters in the appropriate envelopes. The best brains in the country, he thought. Could they help?

He didn't know.

The library was quiet. Roger Toomey closed the *Journal of Theoretical Physics*, placed it on end and stared at its backstrap somberly. The *Journal of Theoretical Physics*! What did any of the contributors to that learned bit of balderdash understand anyway? The thought tore at him. Until so recently they had been the greatest men in the world to him.

And still he was doing his best to live up to their code and philosophy. With Jane's increasingly reluctant

help, he had made measurements. He had tried to weigh the phenomenon in the balance, extract its relationships, evaluate its quantities. He had tried, in short, to defeat it in the only way he knew how — by making of it just another expression of the eternal modes of behavior that all the Universe must follow.

(*Must* follow. The best minds said so.)

Only there was nothing to measure. There was absolutely no sensation of effort to his levitation. Indoors — he dared not test himself outdoors, of course — he could reach the ceiling as easily as he could rise an inch, except that it took more time. Given enough time, he felt, he could continue rising indefinitely; go to the Moon, if necessary.

He could carry weights while levitating. The process became slower, but there was no increase in effort.

The day before he had come on Jane without warning, a stopwatch in one hand.

"How much do you weigh?" he asked.

"One hundred ten," she replied. She gazed at him uncertainly.

He seized her waist with one arm. She tried to push him away but he paid no attention. Together, they moved upward at a creeping pace. She clung to him, white and rigid with terror.

"Twenty-two minutes thirteen seconds," he said, when his head nudged



the ceiling.

When they came down again, Jane tore away and hurried out of the room.

Some days before he had passed a drugstore scale, standing shabbily on a street corner. The street was empty, so he stepped on and put in his penny. Even though he suspected something of the sort, it was a shock to find himself weighing thirty pounds.

He began carrying handfuls of pennies and weighing himself under all conditions. He was heavier on days on which there was a brisk wind, as though he required weight to keep from blowing away.

Adjustment was automatic. Whatever it was that levitated him maintained a balance between comfort and safety. But he could enforce conscious control upon his levitation just as he could upon his respiration. He could stand on a scale and force the pointer up to almost his full weight and down, of course, to nothing.

He bought a scale two days before and tried to measure the rate at which he could change weight. That didn't help. The rate, whatever it was, was faster than the pointer could swing. All he did was collect data on moduli of compressibility and moments of inertia.

Well — What did it all amount to anyway?

He stood up and trudged out of the library, shoulders drooping. He

touched tables and chairs as he walked to the side of the room and then kept his hand unobtrusively on the wall. He had to do that, he felt. Contact with matter kept him continually informed as to his status with respect to the ground. If his hand lost touch with a table or slid upward against the wall — That was it.

The corridor had the usual sprinkling of students. He ignored them. In these last days, they had gradually learned to stop greeting him. Roger imagined that some had come to think of him as queer and most were probably growing to dislike him.

He passed by the elevator. He never took it any more; going down, particularly. When the elevator made its initial drop, he found it impossible not to lift into the air for just a moment. No matter how he lay in wait for the moment, he hopped and people would turn to look at him.

He reached for the railing at the head of the stairs and just before his hand touched it, one of his feet kicked the other. It was the most ungainly stumble that could be imagined. Three weeks earlier, Roger would have sprawled down the stairs.

This time his autonomic system took over and, leaning forward, spread-eagled, fingers wide, legs half-buckled, he sailed down the flight gliderlike. He might have been on wires.

He was too dazed to right himself, too paralyzed with horror to do any-

thing. Within two feet of the window at the bottom of the flight, he came to an automatic halt and hovered.

There were two students on the flight he had come down, both now pressed against the wall, three more at the head of the stairs, two on the flight below, and one on the landing with him, so close they could almost touch one another.

It was very silent. They all looked at him.

Roger straightened himself, dropped to the ground and ran down the stairs, pushing one student roughly out of his way.

Conversation swirled up into exclamation behind him.

"Dr. Morton wants to see me?" Roger turned in his chair, holding one of its arms firmly.

The new department secretary nodded. "Yes, Dr. Toomey."

She left quickly. In the short time since Miss Harroway had resigned, she had learned that Dr. Toomey had something "wrong" with him. The students avoided him. In his lecture room today, the back seats had been full of whispering students. The front seats had been empty.

Roger looked into the small wall mirror near the door. He adjusted his jacket and brushed some lint off but that operation did little to improve his appearance. His complexion had grown sallow. He had lost at least ten pounds since all this had started,

though, of course, he had no way of really knowing his exact weight-loss. He was generally unhealthy-looking, as though his digestion perpetually disagreed with him and won every argument.

He had no apprehensions about this interview with the chairman of the department. He had reached a pronounced cynicism concerning the levitation incidents. Apparently, witnesses didn't talk. Miss Harroway hadn't. There was no sign that the students on the staircase had.

With a last touch at his tie, he left his office.

Dr. Philip Morton's office was not too far down the hall which was a gratifying fact to Roger. More and more, he was cultivating the habit of walking with systematic slowness. He picked up one foot and put it before him, watching. Then he picked up the other and put it before him, still watching. He moved along in a confirmed stoop, gazing at his feet.

Dr. Morton frowned as Roger walked in. He had little eyes, wore a poorly-trimmed grizzled mustache and an untidy suit. He had a moderate reputation in the scientific world and a decided penchant for leaving teaching duties to the members of his staff.

He said, "Say, Toomey, I got the strangest letter from Linus Deering. Did you write to him on"—he consulted a paper on his desk—"the twenty-second of last month. Is this your signature?"

Roger looked and nodded. Anxiously, he tried to read Deering's letter upside down. This was unexpected. Of the letters he had sent out the day of the Miss Harroway incident, only four had so far been answered.

Three of them had consisted of cold one-paragraph replies that read, more or less: "This is to acknowledge receipt of your letter of the 22nd. I do not believe I can help you in the matter you discuss." A fourth, from Ballantine of Northwestern Tech, had bumblingly suggested an institute for psychic research. Roger couldn't tell whether he was trying to be helpful or insulting.

Deering of Princeton made five. He had had high hopes of Deering.

Dr. Morton cleared his throat loudly and adjusted a pair of glasses. "I want to read you what he says. Sit down, Toomey, sit down. He says: 'Dear Phil —'"

Dr. Morton looked up briefly with a slightly fatuous smile. "Linus and I met at Federation meetings last year. We had a few drinks together. Very nice fellow."

He adjusted his glasses again and returned to the letter: "'Dear Phil: Is there a Dr. Roger Toomey in your department? I received a very queer letter from him the other day. I didn't quite know what to make of it. At first, I thought I'd just let it go as another crank letter. Then I

thought that since the letter carried your department heading, you ought to know of it. It's just possible someone may be using your staff as part of a confidence game. I'm enclosing Dr. Toomey's letter for your inspection. I hope to be visiting your part of the country —'

"Well the rest of it is personal." Dr. Morton folded the letter, took off his glasses, put them in a leather container and put that in his breast pocket. He twined his fingers together and leaned forward.

"Now," he said, "I don't have to read you your own letter. Was it a joke? A hoax?"

"Dr. Morton," said Roger, heavily, "I was serious. I don't see anything wrong with my letter. I sent it to quite a few physicists. It speaks for itself. I've made observations on a case of . . . of levitation and I wanted information about possible theoretical explanations for such a phenomenon."

"Levitation! Really!"

"It's a legitimate case, Dr. Morton."

"You've observed it yourself?"

"Of course."

"No hidden wires? No mirrors? Look here, Toomey, you're no expert on these frauds."

"This was a thoroughly scientific series of observations. There is no possibility of fraud."

"You might have consulted me, Toomey, before sending out these letters."

"Perhaps I should have, Dr. Morton, but, frankly, I thought you might be — unsympathetic."

"Well, thank you. I should hope so. And on department stationery, I'm really surprised, Toomey. Look here, Toomey, your life is your own. If you wish to believe in levitation, go ahead, but strictly on your own time. For the sake of the department and the College, it should be obvious that this sort of thing should not be injected into your scholastic affairs.

"In point of fact, you've lost some weight recently, haven't you, Toomey? Yes, you don't look well at all. I'd see a doctor, if I were you. A nerve specialist, perhaps."

Roger said, bitterly, "A psychiatrist might be better, you think?"

"Well, that's entirely your business. In any case, a little rest —"

The telephone had rung and the secretary had taken the call. She caught Dr. Morton's eye and he picked up his extension.

He said, "Hello. . . . Oh, Dr. Smithers, yes. . . . Um-m-m. . . . Yes. . . . Concerning whom? . . . Well, in point of fact, he's with me right now. . . . Yes. . . . Yes, immediately."

He cradled the phone and looked at Roger thoughtfully. "The dean wants to see both of us."

"What about, sir?"

"He didn't say." He got up and stepped to the door. "Are you coming, Toomey?"

"Yes, sir." Roger rose slowly to

his feet, cramming the toe of one foot carefully under Dr. Morton's desk as he did so.

Dean Smithers was a lean man with a long, ascetic face. He had a mouthful of false teeth that fitted just badly enough to give his sibilants a peculiar half-whistle.

"Close the door, Miss Bryce," he said, "and I'll take no phone calls for a while. Sit down, gentlemen."

He stared at them portentously and added, "I think I had better get right to the point. I don't know exactly what Dr. Toomey is doing, but he must stop."

Dr. Morton turned upon Roger in amazement. "What have you been doing?"

Roger shrugged dispiritedly. "Nothing that I can help." He had underestimated student tongue-wagging after all.

"Oh, come, come." The dean registered impatience. "I'm sure I don't know how much of the story to discount, but it seems you must have been engaging in parlor tricks; silly parlor tricks quite unsuited to the spirit and dignity of this institution."

Dr. Morton said, "This is all beyond me."

The dean frowned. "It seems you haven't heard, then. It is amazing to me how the faculty can remain in complete ignorance of matters that fairly saturate the student body. I had never realized it before. I myself

heard of it by accident; by a very fortunate accident, in fact, since I was able to intercept a newspaper reporter who arrived this morning looking for someone he called 'Dr. Toomey, the flying professor.' "

"What?" cried Dr. Morton.

Roger listened haggardly.

"That's what the reporter said. I quote him. It seems one of our students had called the paper. I ordered the newspaperman out and had the student sent to my office. According to him, Dr. Toomey flew — I use the word, 'flew,' because that's what the student insisted on calling it — down a flight of stairs and then back up again. He claimed there were a dozen witnesses."

"I went down the stairs only," muttered Roger.

Dean Smithers was tramping up and down along his carpet now. He had worked himself up into a feverish eloquence. "Now mind you, Toomey, I have nothing against amateur theatricals. In my stay in office I have consistently fought against stuffiness and false dignity. I have encouraged friendliness between ranks in the faculty and have not even objected to reasonable fraternization with students. So I have no objection to your putting on a show for the students *in your own home*."

"Surely you see what could happen to the College once an irresponsible press is done with us. Shall we have a flying professor craze succeed the

flying saucer craze? If the reporters get in touch with you, Dr. Toomey, I will expect you to deny all such reports categorically."

"I understand, Dean Smithers."

"I trust that we shall escape this incident without lasting damage. I must ask you, with all the firmness at my command, never to repeat your . . . uh . . . performance. If you ever do, your resignation will be requested. Do you understand, Dr. Toomey?"

"Yes," said Roger.

"In that case, good day, gentlemen."

Dr. Morton steered Roger back into his office. This time, he shoosed his secretary and closed the door behind her carefully.

"Good heavens, Toomey," he whispered, "has this madness any connection with your letter on levitation?"

Roger's nerves were beginning to twang. "Isn't it obvious? I was referring to myself in those letters."

"You can fly? I mean, levitate?"

"Either word you choose."

"I never heard of such — Damn it, Toomey, did Miss Harroway ever see you levitate?"

"Once. It was an accid —"

"Of course. It's obvious now. She was so hysterical it was hard to make out. She said you had jumped at her. It sounded as though she were accusing you of . . . of —" Dr. Morton

looked embarrassed. "Well, I didn't believe that. She was a good secretary, you understand, but obviously not one designed to attract the attention of a young man. I was actually relieved when she left. I thought she would be carrying a small revolver next, or accusing *me* — You . . . you levitated, eh?"

"Yes."

"How do you do it?"

Roger shook his head. "That's my problem. I don't know."

Dr. Morton allowed himself a smile. "Surely, you don't repeal the law of gravity?"

"You know, I think I do. There must be antigravity involved somehow."

Dr. Morton's indignation at having a joke taken seriously was marked. He said, "Look here, Toomey, this is nothing to laugh at."

"*Laugh* at. Great Scott, Dr. Morton, do I look as though I were laughing?"

"Well — You need a rest. No question about it. A little rest and this nonsense of yours will pass. I'm sure of it."

"It's not nonsense." Roger bowed his head a moment, then said, in a quieter tone. "I tell you what, Dr. Morton, would you like to go in to this with me? In some way this will open new horizons in physical science. I don't know how it works; I just can't conceive of any solution. The two of us together —"

Dr. Morton's look of horror penetrated by that time.

Roger said, "I know it all sounds queer. But I'll demonstrate for you. It's perfectly legitimate. I wish it weren't."

"Now, now," Dr. Morton sprang from his seat. "Don't exert yourself. You need a rest badly. I don't think you should wait till June. You go home right now. I'll see that your salary comes through and I'll look after your course. I used to give it myself once, you know."

"Dr. Morton. This is important."

"I know. I know." Dr. Morton clapped Roger on the shoulder. "Still, my boy, you look under the weather. Speaking frankly, you look like hell. You need a long rest."

"I *can* levitate." Roger's voice was climbing again. "You're just trying to get rid of me because you don't believe me. Do you think I'm lying? What would be my motive?"

"You're exciting yourself needlessly, my boy. You let me make a phone call. I'll have someone take you home."

"I tell you I *can* levitate," shouted Roger.

Dr. Morton turned red. "Look, Toomey, let's not discuss it. I don't care if you fly up in the air right this minute."

"You mean seeing isn't believing as far as you're concerned?"

"Levitation? Of course not." The department chairman was bellowing.



"If I saw you fly, I'd see an optometrist or a psychiatrist. I'd sooner believe myself insane than that the laws of physics —"

He caught himself, harumphed loudly. "Well, as I said, let's not discuss it. I'll just make this phone call."

"No need, sir. No need," said Roger. "I'll go. I'll take my rest. Good-by."

He walked out rapidly, moving more quickly than at any time in days. Dr. Morton, on his feet, hands flat on his desk, looked at his departing back with relief.

James Sarle, M.D. was in the

living room when Roger arrived home. He was lighting his pipe as Roger stepped through the door, one large-knuckled hand enclosing the bowl. He shook out the match and his ruddy face crinkled into a smile.

"Hello, Roger. Resigning from the human race? Haven't heard from you in over a month."

His black eyebrows met above the bridge of his nose, giving him a rather forbidding appearance that somehow helped him establish the proper atmosphere with his patients.

Roger turned to Jane, who sat buried in an armchair. As usual lately, she had a look of wan exhaustion on her face.

Roger said to her, "Why did you bring him here?"

"Hold it! Hold it, man," said Sarle. "Nobody brought me. I met Jane downtown this morning and invited myself here. I'm bigger than she is. She couldn't keep me out."

"Met her by coincidence, I suppose? Do you make appointments for all your coincidences?"

Sarle laughed, "Let's put it this way. She told me a little about what's been going on."

June said, wearily, "I'm sorry if you disapprove; Roger, but it was the first chance I had to talk to someone who would understand."

"What makes you think he understands? Tell me, Jim, do you believe her story?"

Sarle said, "It's not an easy thing to believe. You'll admit that. But I'm trying."

"All right, suppose I flew. Suppose I levitated right now. What would you do?"

"Faint, maybe. Maybe I'd say, 'Holy Pete.' Maybe I'd bust out laughing. Why don't you try, and then we'll see?"

Roger stared at him. "You really want to see it?"

"Why shouldn't I?"

"The ones that have seen it screamed or ran or froze with horror. Can you take it, Jim?"

"I think so."

"O.K." Roger slipped two feet upward and executed a slow ten-

fold *entrechat*. He remained in the air, toes pointed downward, legs together, arms gracefully outstretched in bitter parody.

"Better than Nijinski, eh, Jim?"

Sarle did none of the things he suggested he might do. Except for catching his pipe as it dropped, he did nothing at all.

Jane had closed her eyes. Tears squeezed quietly through the lids.

Sarle said, "Come down, Roger."

Roger did so. He took a seat and said, "I wrote to physicists, men of reputation. I explained the situation in an impersonal way. I said I thought it ought to be investigated. Most of them ignored me. One of them wrote to old man Morton to ask if I were crooked or crazy."

"Oh, Roger," whispered Jane.

"You think that's bad? The dean called me into his office today. I'm to stop my parlor tricks, he says. It seems I had stumbled down the stairs and automatically levitated myself to safety. Morton says he wouldn't believe I could fly if he saw me in action. Seeing isn't believing in this case, he says, and orders me to take a rest. I'm not going back."

"Roger," said Jane, her eyes opening wide. "Are you serious?"

"I can't go back. I'm sick of them. Scientists!"

"But what will you do?"

"I don't know." Roger buried his head in his hands. He said in a muffled voice, "You tell me, Jim. You're

the psychiatrist. Why won't they believe me?"

"Perhaps it's a matter of self-protection, Roger," said Sarle, slowly. "People aren't happy with anything they can't understand. Even some centuries ago when many people *did* believe in the existence of extra-natural abilities, like flying on broomsticks, for instance, it was almost always assumed that these powers originated with the forces of evil.

"People still think so. They may not believe literally in the devil, but they do think that what is strange is evil. They'll fight against believing in levitation — or be scared to death if the fact is forced down their throats. That's true, so let's face it."

Roger shook his head. "You're talking about people, and I'm talking about scientists."

"Scientists are people."

"You know what I mean. I have here a phenomenon. It isn't witchcraft. I haven't dealt with the devil. Jim, there must be a natural explanation. We don't know all there is to know about gravitation. We know hardly anything, really. Don't you suppose it's just barely conceivable that there is some biological method of nullifying gravity. Perhaps I am a mutation of some sort. I have a . . . well, call it a muscle . . . which can abolish gravity. At least it can abolish the effect of gravity on myself. Well, let's investigate it. Why sit on our hands? If we have antigravity, imag-

ine what it will mean to the human race."

"Hold it, Rog," said Sarle. "Think about the matter a while. Why are *you* so unhappy about it? According to Jane, you were almost mad with fear the first day it happened, *before* you had any way of knowing that science was going to ignore you and that your superiors would be unsympathetic."

"That's right," murmured Jane.

Sarle said, "Now why should that be? Here you had a great, new, wonderful power; a sudden freedom from the deadly pull of gravity."

Roger said, "Oh, don't be a fool. It was — horrible. I couldn't understand it. I still can't."

"Exactly, my boy. It was something you couldn't understand and *therefore* something horrible. You're a physical scientist. You *know* what makes the universe run. Or if you don't know, you know someone else knows. Even if no one understands a certain point, you know that some day someone will know. The key word is *know*. It's part of your life. Now you come face to face with a phenomenon which you consider to violate one of the basic laws of the universe. Scientists say: Two masses will attract one another according to a fixed mathematical rule. It is an inalienable property of matter and space. There are no exceptions. And now you're an exception."

Roger said, glumly, "And how."

"You see, Roger," Sarle went on, "for the first time in history, mankind really has what he considers unbreakable rules. I mean, unbreakable. In primitive cultures, a medicine man might use a spell to produce rain. If it didn't work, it didn't upset the validity of magic. It just meant that the shaman had neglected some part of his spell, or had broken a taboo, or offended a god. In modern theocratic cultures, the commandments of the Deity are unbreakable. Still if a man were to break the commandments and yet prosper, it would be no sign that that particular religion was invalid. The ways of Providence are admittedly mysterious and some invisible punishment awaits.

"Today, however, we have rules that *really* can't be broken, and one of them is the existence of gravity. It works even though the man who invokes it has forgotten to mutter em-em-over-ahr-square."

Roger managed a twisted smile. "You're all wrong, Jim. The unbreakable rules have been broken over and over again. Radioactivity was impossible when it was discovered. Energy came out of nowhere; incredible quantities of it. It was as ridiculous as levitation."

"Radioactivity was an objective phenomenon that could be communicated and duplicated. Uranium would fog photographic film for anyone. A Crookes tube could be built by anyone and would deliver an electron

stream in identical fashion for all. You —"

"I've tried communicating —"

"I know. But can you tell me, for instance, how *I* might levitate."

"Of course not."

"That limits others to observation only without experimental duplication. It puts your levitation on the same plane with stellar evolution, something to theorize about but never experiment with."

"Yet scientists are willing to devote their lives to astrophysics."

"Scientists are people. They can't reach the stars, so they make the best of it. But they can reach you and to be unable to touch your levitation would be infuriating."

"Jim, they haven't even tried. You talk as though I've been studied. Jim, they won't even consider the problem."

"They don't have to. Your levitation is part of a whole class of phenomena that won't be considered. Telepathy, clairvoyance, prescience and a thousand other extra-natural powers are practically never seriously investigated, even though reported with every appearance of reliability. Rhine's experiments on E.S.P. have annoyed far more scientists than they have intrigued. So you see, they don't have to study you to know they don't want to study you. They know that in advance."

"Is this funny to you, Jim? Scientists refuse to investigate facts; they

turn their back on the truth. And you just sit there and grin and make droll statements."

"No, Roger, I know it's serious. And I have no glib explanations for mankind, really. I'm giving you my thoughts. It's what I think. But don't you see? What I'm doing, really, is to try to look at things as they are. It's what you must do. Forget your ideals, your theories, your notions as to what people *ought* to do. Consider what they *are* doing. Once a person is oriented to face facts rather than delusions, problems tend to disappear. At the very least, they fall into their true perspective and become soluble."

Roger stirred restlessly. "Psychiatric gobbledygook! It's like putting your fingers on a man's temple and saying, 'Have faith and you will be cured!' If the poor sap isn't cured, it's because he didn't drum up enough faith. The witch doctor can't lose."

"Maybe you're right, but let's see. What *is* your problem?"

"No catechism, please. You know my problem so let's not horse around."

"You levitate. Is that it?"

"Let's say it is. It'll do as a first approximation."

"You're not being serious, Roger, but actually you're probably right. It's only a first approximation. After all you're tackling that problem. Jane tells me you've been experimenting."

"Experimenting! Ye Gods, Jim,

I'm not experimenting. I'm drifting. I need high-powered brains and equipment. I need a research team and I don't have it."

"Then what's your problem? Second approximation."

Roger said, "I see what you mean. My problem is to get a research team. But I've tried! Man, I've tried till I'm tired of trying."

"How have you tried?"

"I've sent out letters. I've asked — Oh, stop it, Jim. I haven't the heart to go through the patient-on-the-couch routine. You know what I've been doing."

"I know that you've said to people, 'I have a problem. Help me.' Have you tried anything else?"

"Look, Jim. I'm dealing with mature scientists."

"I know. So you reason that the straightforward request is sufficient. Again it's theory against fact. I've told you the difficulties involved in your request. When you thumb a ride on a highway you're making a straightforward request, but most cars pass you by just the same. The point is that the straightforward request has failed. Now what's your problem? Third approximation!"

"To find another approach which won't fail? Is that what you want me to say?"

"It's what you have said, isn't it?"

"So I know it without your telling me."

"Do you? You're ready to quit

school, quit your job, quit science. Where's your consistency, Rog? Do you abandon a problem when your first experiment fails? Do you give up when one theory is shown to be inadequate? The same, philosophy of experimental science that holds for inanimate objects should hold for people as well."

"All right. What do you suggest I try? Bribery? Threats? Tears?"

James Sarle stood up. "Do you really want a suggestion?"

"Go ahead."

"Do as Dr. Morton said. Take a vacation and to hell with levitation. It's a problem for the future. Sleep in bed and float or don't float; what's the difference. Ignore levitation, laugh at it or even enjoy it. Do anything but worry about it, because it isn't your problem. That's the whole point. It's not your immediate problem. Spend your time considering how to make scientists study something they don't want to study. That is the immediate problem and that is exactly what you've spent no thinking time on as yet."

Sarle walked to the hall closet and got his coat. Roger went with him. Minutes passed in silence.

Then Roger said without looking up, "Maybe you're right, Jim."

"Maybe I am. Try it and then tell me. Good-by, Roger."

Roger Toomey opened his eyes and blinked at the morning brightness

of the bedroom. He called out, "Hey, Jane, where are you?"

Jane's voice answered, "In the kitchen. Where do you think?"

"Come in here, will you?"

She came in. "The bacon won't fry itself, you know."

"Listen, did I float last night?"

"I don't know. I slept."

"You're a help." He got out of bed and slipped his feet into his mules. "Still I don't think I did."

"Do you think you've forgotten how?" There was sudden hope in her voice.

"I haven't forgotten. See!" He slid into the dining room on a cushion of air. "I just have a feeling I haven't floated. I think it's three nights now."

"Well, that's good," said Jane. She was back at the stove. "It's just that a month's rest has done you good. If I had called Jim in the beginning —"

"Oh, please, don't go through that. A month's rest, my eye. It's just that last Sunday I made up my mind what to do. Since then I've relaxed. That's all there is to it."

"What are you going to do?"

"Every spring Northwestern Tech gives a series of seminars on physical topics. I'll attend."

"You mean, go way out to Seattle."

"Of course."

"What will they be discussing?"

"What's the difference? I just want to see Linus Deering."

"But he's the one who called you

crazy, isn't he?"

"He did." Roger scooped up a forkful of scrambled eggs. "But he's also the best man of the lot."

He reached for the salt and lifted a few inches out of his chair as he did so. He paid no attention.

He said, "I think maybe I can handle him."

The spring seminars at Northwestern Tech had become a nationally known institution since Linus Deering had joined the faculty. He was the perennial chairman and lent the proceedings their distinctive tone. He introduced the speakers, led the questioning periods, summed up at the close of each morning and afternoon session and was the soul of conviviality at the concluding dinner at the end of the week's work.

All this Roger Toomey knew by report. He could now observe the actual workings of the man. Professor Deering was rather under the middle height, was dark of complexion and had a luxuriant and quite distinctive mop of wavy brown hair. His wide, thin-lipped mouth when not engaged in active conversation looked perpetually on the point of a sly smile. He spoke quickly and fluently, without notes, and seemed always to deliver his comments from a level of superiority that his listeners automatically accepted.

At least, so he had been on the first morning of the seminar. It was only

during the afternoon session that the listeners began to notice a certain hesitation in his remarks. Even more, there was an uneasiness about him as he sat on the stage during the delivery of the scheduled papers. Occasionally, he glanced furtively toward the rear of the auditorium.

Roger Toomey, seated in the very last row, observed all this tensely. His temporary glide toward normality that had begun when he first thought there might be a way out was beginning to recede.

On the Pullman to Seattle, he had not slept. He had had visions of himself lifting upward in time to the wheel-clacking, of moving out quietly past the curtains and into the corridor, of being awakened into endless embarrassment by the hoarse shouting of a porter. So he had fastened the curtains with safety pins and had achieved nothing by that; no feeling of security; no sleep outside a few exhausting snatches.

He had napped in his seat during the day, while the mountains slipped past outside, and arrived in Seattle in the evening with a stiff neck, aching bones, and a general sensation of despair.

He had made his decision to attend the seminar far too late to have been able to obtain a room to himself at the Institute's dormitories. Sharing a room was, of course, quite out of the question. He registered at a downtown hotel, locked the door, closed



and locked all the windows, shoved his bed hard against the wall and the bureau against the open side of the bed; then slept.

He remembered no dreams, and when he awoke in the morning he was still lying within the manufactured enclosure. He felt relieved.

When he arrived, in good time, at Physics Hall on the Institute's campus, he found, as he expected, a large room and a small gathering. The seminar sessions were held, traditionally, over the Easter vacation and students were not in attendance. Some fifty physicists sat in an auditorium designed to hold four hundred, clustering on either side of the central aisle up near the podium.

Roger took his seat in the last row, where he would not be seen by casual

passers-by looking through the high, small windows of the auditorium door, and where the others in the audience would have had to twist through nearly a hundred eighty degrees to see him.

Except, of course, for the speaker on the platform—and for Professor Deering.

Roger did not hear much of the actual proceedings. He concentrated entirely on waiting for those moments when Deering was alone on the platform; when only Deering could see him.

As Deering grew obviously more disturbed, Roger grew bolder. During the final summing up of the afternoon, he did his best.

Professor Deering stopped altogether in the middle of a poorly-

constructed and entirely meaningless sentence. His audience, which had been shifting in their seats for some time stopped also and looked wonderingly at him.

Deering raised his hand and said, gaspingly, "You! You there!"

Roger Toomey had been sitting with an air of complete relaxation—in the very center of the aisle. The only chair beneath him was composed of two and a half feet of empty air. His legs were stretched out before him on the armrest of an equally airy chair.

When Deering pointed, Roger slid rapidly sidewise. By the time fifty heads turned, he was sitting quietly in a very prosaic wooden seat.

Roger looked this way and that, then stared at Deering's pointing finger and rose.

"Are you speaking to me, Professor Deering?" he asked, with only the slightest tremble in his voice to indicate the savage battle he was fighting within himself to keep that voice cool and wondering.

"What are you doing?" demanded Deering, his morning's tension exploding.

Some of the audience were standing in order to see better. An unexpected commotion is as dearly loved by a gathering of research physicists as by a crowd at a baseball game.

"I'm not doing anything," said Roger. "I don't understand you."

"Get out! Leave this hall!"

Deering was beside himself with a mixture of emotions, or perhaps he would not have said that. At any rate, Roger sighed and took his opportunity prayerfully.

He said, loudly and distinctly, forcing himself to be heard over the gathering clamor, "I am Professor Roger Toomey of Carson College. I am a member of the American Physical Association. I have applied for permission to attend these sessions, have been accepted, and have paid my registration fee. I am sitting here as is my right and will continue to do so."

Deering could only say blindly, "Get out!"

"I will not," said Roger. He was actually trembling with a synthetic and self-imposed anger. "For what reason must I get out? What have I done?"

Deering put a shaking hand through his hair. He was quite unable to answer.

Roger followed up his advantage. "If you attempt to evict me from these sessions without just cause, I shall certainly sue the Institute."

Deering said, hurriedly, "I call the first day's session of the Spring Seminars of Recent Advances in the Physical Sciences to a close. Our next session will be in this hall tomorrow at nine in—"

Roger left as he was speaking and hurried away.

There was a knock at Roger's hotel-

room door that night. It startled him, froze him in his chair.

"Who is it?" he cried.

The answering voice was soft and hurried. "May I see you?"

It was Deering's voice. Roger's hotel as well as his room number were, of course, recorded with the seminar secretary. Roger had hoped, but scarcely expected, that the day's events would have so speedy a consequence.

He opened the door, said stiffly, "Good evening, Professor Deering."

Deering stepped in and looked about. He wore a very light topcoat that he made no gesture to remove. He held his hat in his hand and did not offer to put it down.

He said, "Professor Roger Toomey of Carson College. Right?" He said it with a certain emphasis, as though the name had significance.

"Yes. Sit down, professor."

Deering remained standing. "Now what is it? What are you after?"

"I don't understand."

"I'm sure you do. You aren't arranging this ridiculous foolery for nothing. Are you trying to make me seem foolish or is it that you expect to hoodwink me into some crooked scheme. I want you to know it won't work. And don't try to use force now. I have friends who know exactly where I am at this moment. I'll advise you to tell the truth and then get out of town."

"Professor Deering! This is my

room. If you are here to bully me, I'll ask you to leave. If you don't go, I'll have you put out."

"Do you intend to continue this . . . this persecution?"

"I have not been persecuting you. I don't know you, sir."

"Aren't you the Roger Toomey who wrote me a letter concerning a case of levitation he wanted me to investigate?"

Roger stared at the man. "What letter is this?"

"Do you deny it?"

"Of course I do. What are you talking about? Have you got the letter?"

Professor Deering's lips compressed. "Never mind that. Do you deny you were suspending yourself on wires at this afternoon's sessions?"

"On wires? I don't follow you at all."

"You were levitating!"

"Would you please leave, Professor Deering? I don't think you're well."

The physicist raised his voice. "Do you deny you were levitating?"

"I think you're mad. Do you mean to say I made magician's arrangements in your auditorium. I was never in it before today and when I arrived you were already present. Did you find wires or anything of the sort after I left?"

"I don't know how you did it and I don't care. Do you deny you were levitating?"

"Why, of course I do."

"I saw you. Why are you lying?"

"You saw me levitate? Professor Deering, will you tell me how that's possible? I suppose your knowledge of gravitational forces is enough to tell you that true levitation is a meaningless concept except in outer space. Are you playing some sort of joke on me?"

"Good Heavens," said Deering in a shrill voice, "why won't you tell the truth?"

"I am. Do you suppose that by stretching out my hand and making a mystic pass . . . so . . . I can go sailing off into air." And Roger did so, his head brushing the ceiling.

Deering's head jerked upward, "Ah! There . . . there—"

Roger returned to earth, smiling. "You *can't* be serious."

"You did it again. You just did it."

"Did what, sir?"

"You levitated. You just levitated. You can't deny it."

Roger's eyes grew serious. "I think you're sick, sir."

"I know what I saw."

"Perhaps you need a rest. Overwork—"

"It was *not* a hallucination."

"Would you care for a drink?"

Roger walked to his suitcase while Deering followed his footsteps with bulging eyes. The toes of his shoes touched air two inches from the ground and went no lower.

Deering sank into the chair Roger had vacated.

"Yes, please," he said, weakly.

Roger gave him the whiskey bottle, watched the other drink, then gag a bit. "How do you feel now?"

"Look here," said Deering, "have you discovered a way of neutralizing gravity?"

Roger stared. "Get hold of yourself, professor. If I had antigravity, I wouldn't use it to play games on you. I'd be in Washington. I'd be a military secret. I'd be— Well, I wouldn't be here! Surely all this is obvious to you."

Deering jumped to his feet. "Do you intend sitting in on the remaining sessions?"

"Of course."

Deering nodded, jerked his hat down upon his head and hurried out.

For the next three days, Professor Deering did not preside over the seminar sessions. No reason for his absence was given. Roger Toomey, caught between hope and apprehension, sat in the body of the audience and tried to remain inconspicuous. In this, he was not entirely successful. Deering's public attack had made him notorious while his own strong defense had given him a kind of David versus Goliath popularity.

Roger returned to his hotel room Thursday night after an unsatisfactory dinner and remained standing in the doorway, one foot over the threshold. Professor Deering was gazing at him from within. And another man, a gray fedora shoved well back on his

forehead, was seated on Roger's bed.

It was the stranger who spoke. "Come inside, Toomey."

Roger did so. "What's going on?"

The stranger opened his wallet and presented a cellophane window to Roger. He said, "I'm Cannon of the F.B.I."

Roger said, "You have influence with the government, I take it, Professor Deering."

"A little," said Deering.

Roger said, "Well, am I under arrest? What's my crime?"

"Take it easy," said Cannon. "We've been collecting some data on you, Toomey. Is this your signature?"

He held a letter out far enough for Roger to see, but not to snatch. It was the letter Roger had written to Deering which the latter had sent on to Morton.

"Yes," said Roger.

"How about this one?" The federal agent had a sheaf of letters.

Roger realized that he must have collected every one he had sent out, minus those that had been torn up. "They're all mine," he said, wearily.

Deering snorted.

Cannon said, "Professor Deering tells us that you can float."

"Float? What the devil do you mean, float?"

"Float in the air," said Cannon, stolidly.

"Do you believe anything as crazy as that?"

"I'm not here to believe or not to

believe, Dr. Toomey," said Cannon. "I'm an agent of the Government of the United States and I've got an assignment to carry out. I'd co-operate if I were you."

"How can I co-operate in something like this? If I came to you and told you that Professor Deering could float in air, you'd have me flat on a psychiatrist's couch in no time."

Cannon said, "Professor Deering has been examined by a psychiatrist at his own request. However, the government has been in the habit of listening very seriously to Professor Deering for a number of years now. Besides, I might as well tell you that we have independent evidence."

"Such as?"

"A group of students at your college have seen you float. Also, a woman who was once secretary to the head of your department. We have statements from all of them."

Roger said, "What kind of statements? Sensible ones that you would be willing to put into the record and show to my congressman?"

Professor Deering interrupted anxiously, "Dr. Toomey, what do you gain by denying the fact that you can levitate? Your own dean admits that you've done something of the sort. He has told me that he will inform you officially that your appointment will be terminated at the end of the academic year. He wouldn't do that for nothing."

"That doesn't matter," said Roger.

"But why won't you admit I saw you levitate?"

"Why should I?"

Cannon said, "I'd like to point out, Dr. Toomey, that if you have any device for counteracting gravity, it would be of great importance to your government."

"Really? I suppose you have investigated my background for possible disloyalty."

"The investigation," said the agent, "is proceeding."

"All right," said Roger, "let's take a hypothetical case. Suppose I admitted I could levitate. Suppose I didn't know how I did it. Suppose I had nothing to give the government but my body and an insoluble problem."

"How can you know it's insoluble?" asked Deering, eagerly.

"I once asked you to study such a phenomenon," pointed out Roger, mildly. "You refused."

"Forget that. Look," Deering spoke rapidly, urgently. "You don't have a position at the moment. I can offer you one in my department as Associate Professor of Physics. Your teaching duties will be nominal. Full time research on levitation. What about it?"

"It sounds attractive," said Roger.

"I think it's safe to say that unlimited government funds will be available."

"What do I have to do? Just admit I can levitate?"

"I know you can. I saw you. I want you to do it now for Mr. Cannon."

Roger's legs moved upward and his body stretched out horizontally at the level of Cannon's head. He turned to one side and seemed to rest on his right elbow.

Cannon's hat fell backward onto the bed.

He yelled: "He floats."

Deering was almost incoherent with excitement. "Do you see it, man?"

"I sure see something."

"Then report it. Put it right down in your report, do your hear me? Make a complete record of it. They won't say there's anything wrong with me. I didn't doubt for a minute that I had seen it."

But he couldn't have been so happy if that were entirely true.

"I don't even know what the climate is like in Seattle," wailed Jane, "and there are a million things I have to do."

"Need any help?" asked Jim Sarle from his comfortable position in the depths of the armchair.

"There's nothing you can do. Oh, dear." And she flew from the room, but unlike her husband, she did so figuratively only.

Roger Toomey came in. "Jane, do we have the crates for the books yet? Hello, Jim. When did you come in? And where's Jane?"

"I came in a minute ago and Jane's in the next room. I had to get past a

policeman to get in. Man, they've got you surrounded."

"Um-m-m," said Roger, absently. "I told them about you."

"I know you did. I've been sworn to secrecy. I told them it was a matter of professional confidence in any case. Why don't you let the movers do the packing? The government is paying, isn't it?"

"Movers wouldn't do it right," said Jane, suddenly hurrying in again and flouncing down on the sofa. "I'm going to have a cigarette."

"Break down, Roger," said Sarle, "and tell me what happened."

Roger smiled sheepishly. "As you said, Jim, I took my mind off the wrong problem and applied it to the right one. It just seemed to me that I was forever being faced with two alternatives. I was either crooked or crazy. Deering said that flatly in his letter to Morton. The dean assumed I was crooked and Morton suspected that I was crazy.

"But supposing I could show them that I could really levitate. Well, Morton told me what would happen in that case. Either I would be crooked or the *witness* would be insane. Morton said that . . . he said that if he saw me fly, he'd prefer to believe himself insane than accept the evidence. Of course, he was only being rhetorical. No man would believe in his own insanity while even the faintest alternative existed. I counted on that.

"So I changed my tactics. I went to Deering's seminar. I didn't *tell* him I could float; I showed him, *and then denied I had done it*. The alternative was clear. I was either lying or he . . . not I, mind you, but *he* . . . was mad. It was obvious that he would sooner believe in levitation than doubt his own sanity, once he was really put to the test. All his actions thereafter; his bullying, his trip to Washington, his offer of a job, were all intended only to vindicate his own sanity, not to help me."

Sarle said, "In other words you had made your levitation his problem and not your own."

Roger said, "Did you have anything like this in mind when we had our talk, Jim?"

Sarle shook his head. "I had vague notions but a man must solve his own problems if they're to be solved effectively. Do you think they'll work out the principle of levitation now?"

"I don't know, Jim. I still can't communicate the subjective aspects of the phenomenon. But that doesn't matter. We'll be investigating them and that's what counts." He struck his balled right fist into the palm of his left hand. "As far as I'm concerned the important point is that I made them help me."

"Is it?" asked Sarle, softly. "I should say that the important point is that you let them make *you* help *them*, which is a different thing altogether."

THE END

FILMING

"WAR OF THE WORLDS"

You'll see the movie—it's a good show. But it's also the end result of technical feats that any laboratory man can appreciate! The Special-Effects man, today, combines inspiration with perspiration — using lots of both!

BY GEORGE PAL

Producer of "War of the Worlds," a Paramount Picture

Whenever a Hollywood producer brings out a new motion picture in which he has tampered with the plot of a well-known novel or play, he's inviting criticism.

We took that risk when we made the H. G. Wells classic, "War Of The Worlds," but inasmuch as none of us connected with it have been dodging any verbal tomatoes since, I take it that the audiences approve.

"War Of The Worlds" was on my agenda of future projects almost since the day I arrived at Paramount Studio two and one half years ago after producing my first science-fiction venture, "Destination Moon" for Eagle-Lion release.

Paramount had owned the Wells

story for some twenty-six years but no producer had ever tackled it, although it had been discussed several times. But now with the big vogue for films of a science-fiction nature it seemed a logical choice.

So it was natural that I selected it as one of my first story properties for future production.

I was stimulated by the problems it posed. Although written fifty-six years ago, in many respects it had withstood the advances of time remarkably well and remained today an exciting and visionary story of the future.

It offered me my greatest challenge to date in figuring out how to film the Martian machines, their heat and disintegration rays and the destruction



The filming of a science-fiction movie requires a series of technical triumphs in the model shop. Here, the operating mechanism of a heat-ray that has to work practically is installed in a Martian flying wing.

and chaos they cause when they invade Earth.

It ended up by being my most costly picture to date, \$2,000,000, as contrasted with \$586,000 for "Destination Moon," and \$936,000 for "When Worlds Collide."

It also took the longest period of time to make. More than six months of special-effects work plus an additional two months for optical effects were needed after our regular shooting schedule with the cast was concluded;

work with the cast took forty days at the studio and on location in Arizona.

More special-effects work went into "War Of The Worlds" than any of my other pictures. More than four times as many, for instance, as went into "When Worlds Collide."

Actually one half of the final completed picture which you see on the screen consists of some form of special-effects created by our exceptional department here at Paramount Stu-

dio.

It is my great sorrow that my good friend Gordon Jennings, Paramount Special-Effects Director for more than two decades, a multiple Academy Award winner and the recognized leader in his field, died of a heart attack shortly after we finished work on the picture and before it was shown publicly.

If for one moment you think the challenge of modernizing Wells' story was child's play, just take a scrap of paper and list the commonplace inventions and scientific discoveries which we utilize in our daily living that were utterly nonexistent when Wells wrote his story.

There were no airplanes, atom bombs or tanks with which to fight the Martian machines at the time he wrote his tale. His readers followed his story on a flight of imagination. Our audience comes to the theater today conversant with the terms: nuclear physics, atomic fission, gravitational fields and space platforms.

Even the children play with space helmets and ray guns and are even more familiar with such expressions as "blast off" than their elders.

It was exciting to take Wells' imaginative work and couple it with modern discoveries and come up with a film that would be entertaining, credible and believable to an audience geared to scientific awareness.

One of our first decisions was to

move the setting from London and environs to Southern California. It was more practical to shoot in an easily accessible area. Also influencing our decision were the many stories of flying saucers in the last few years which have emanated from the western part of the United States.

Our audiences might well believe that such a Martian invasion could take place in such a locale.

Los Angeles as the metropolis invaded by the Martians was a logical choice, too, because it was possible for us to arrange to actually clear a portion of the city streets of the populace for several of our scenes.

I'll wager that if I could climb into the Time Machine which Wells wrote about in another story and flash back fifty-six years for a conference with the gentleman, he'd have approved the changes.

Now how he would have taken our addition of a romantic interest I won't hazard a guess. But in the film business you have to be practical. No one is less interested in doing routine boy meets girl stories than I. But a boy-and-girl theme is necessary even in a science-fiction film of the scope of "War Of The Worlds." Audiences want it.

So we introduced a young college scientist played by a talented newcomer named Gene Barry. As his companion we cast Ann Robinson, another bright new talent.

In one respect we hewed right to

the Wells original. That was in his conception of a Martian being.

He dreamed up an octopuslike creature. We made ours a huge crablike being with one giant Cyclops eye with three separate lenses, a big head to hold its oversize brain, and long spindly tentacles with suckers on the end for arms.

The Martian was the handiwork of our talented young unit art director Albert Nozaki who worked throughout with us from start to finish under Paramount supervising art director Hal Pereira.

After Nozaki finished his design I called in a sculptor, make-up man and artist named Charles Gemora, who became famous as the gorilla in the film "Ingagi" years ago. I asked him to build the monster.

He built it out of papier-maché and sheet rubber, created arms that actually pulsed—through the use of rubber tubing in them—and painted the whole thing lobster red. It was a startler all right—something right out of your worst nightmare.

Gemora is a short-statured man who could fit into the contraption too, so we hired him to operate it. When he got inside he moved around on his knees, holding his arms hunched out. His hands came just to the elbows of the Martian's formidable-looking tentacles.

Then we showed only one fleeting glimpse of the creature in the final picture! All that effort, money and

time for a few seconds on the screen.

Why? Naturally there was an argument on how much the Martian was to be shown in the finished picture. But we decided that a hint of horror is often more effective than a large dose. And anyway, would you have wanted to know this thing intimately?

Our greatest special-effects problem in the production was building and operating the warlike Martian machines which land on Earth to destroy its inhabitants. We came close to electrocuting our crew in designing this one.

We went back to the original Wells book for inspiration. My first edition is illustrated with scenes of a huge, disklike object on giant stilts.

However, Wells' conception of the machines was mechanical. In this era we decided ours should be electrical.

I wish we'd never seen the illustrations of the stiltlike legs at all! We'd have saved a lot of grief. For the original plan, worked out by the special-effects people, was to have the machines—which were to be miniatures—rest on three pulsating beams of static electricity serving as legs.

The idea was to use a high-voltage electrical discharge of some one million volts fed down to the legs from wires suspended from an overhead rig on the sound stage. A high velocity blower was used from behind to force the sparks down the legs.

We made tests under controlled



Technicians, rather than actors, dominate the movie lot; the job calls for the closest co-operation between photographic technologists and model show experts. What one can't do, the other must

conditions on our special-effects stage and they were spectacular. I couldn't

have been more delighted.

But there was one great problem.

It was dangerous to generate a million volts on a regular sound stage. It would be too easy for the sparks to jump to damp dust, dirt, metal, or what have you. It could have killed someone, perhaps set the studio on fire.

So after the test opening scene we reluctantly gave up the electrical legs for the machine, although a great deal of hard work had already been expended on them.

It was in actuality as dangerous as we had wanted it to be on the screen!

The Martian machine and its destructive rays, although looming large on the screen, in reality was scaled down to one sixth real size when we filmed it.

We built three miniature machines, forty-two inches in diameter and made out of copper to maintain the reddish hue always identified with Mars, the red planet.

They were flat, semi-disk shaped objects. We gave them three distinctive features, a long cobra neck which emitted a disintegrating ray, an electrical TV camera type scanner on the end of a snakelike metal coil which emerged from the body of the machine, and wing-tip flame throwers.

Each machine was operated by fifteen hair-fine wires connected to a device on an overhead track. By means of these wires we carried the electrical controls to make the cobra neck, the scanning eye and other portions operate properly.

This was indeed puppetry on a huge scale!

Here is another trade trick on how we made the triple-lensed scanner:

It was actually thick plastic with hexagonal holes cut in it. Behind these, rotating light shutters gave a flickering effect.

But in creating the flicker we got into fresh trouble. We got a strobatach effect, the sort of thing you see in a movie of wagon wheels in which the turning spokes seem to go faster, then slower when they are in conflict with the camera shutter speed. Our answer was to very carefully regulate the shutter speed behind the head.

Those vicious-looking fire rays emanating from the machines were burning welding wire. As the wire melted, a blow torch set up behind, blew the wire out. The finished result looked highly realistic.

Before we ever started shooting the picture, more than one thousand sketches were prepared by Nozaki supervised by Art Director Pereira, working in close collaboration with Director Byron Haskin. These showed their conception of how combined live action and special effects, or each of them separately, would look.

Originally, they were rough sketches but by the time we were ready to begin shooting in January, 1952, detailed drawings were completed and inserted at the proper places in the script to guide Director Haskin, Cameraman George Barnes, A.S.C.,

and the rest of the crew.

It isn't customary to detail so carefully what each scene and camera setup will look like but in a science-fiction film of this type, it is vitally necessary to hold down costs and production time.

Nozaki's drawings were especially valuable in the extensive sequence showing the evacuation of Los Angeles and the attack on the city by the Martian machines. Both live action and special- and optical-effects were extensively mixed in these complex scenes.

In addition to shooting the downtown section of Los Angeles in real life, we created it in miniature on a Paramount sound stage.

Miniatures are becoming a worse headache with each picture made. I've learned that even the bobby-soxers can spot them in most films these days.

We absolutely had to maintain an aura of credibility and authenticity for our story. This tends to give those expensive ulcers to special-effects men and producers you read about.

As a result we built miniatures more carefully than ever before. We strove for lifelike authenticity by making them larger. Our Los Angeles City Hall miniature, for example, was eight feet tall.

Quite a few experts told me that they couldn't distinguish between the miniatures and the real thing which

really made me feel proud.

A check was made with Civil Defense Authorities before staging the evacuation scenes in order to incorporate the latest techniques for such an emergency.

Automobiles, rather than tuxedos, were the requirements for the nine hundred extras hired for the sequence. We wanted a traffic jam.

One of the scenes turned out to be unrehearsed real life. During the filming we heard one day that there had been a crash on the new Hollywood Freeway which had caused a bad traffic tie-up. A camera crew was rushed to the spot like a newsreel staff and caught the scene.

We needed a deserted city. Ours was Los Angeles at 5:00 a.m. on a Sunday morning. Its normally clear streets at that hour were enforced by police outposts hooked up with our company by walkie-talkie.

It was hard work to frame a panic evacuation scene—but even more work to clean up the fallen masonry, rubble, papers, and trash scattered for blocks up and down the center of one of America's largest cities afterwards.

Here's an example of how we tied in special-effects with the real-life evacuation:

We photographed a street on our back lot. With this we matched four by five ectachrome still shots of Bunker Hill in downtown Los Angeles. These were rephotographed on Technicolor film.



Realism is earned; it doesn't just happen. For the horse-opera, any piece of Western desert scenery will do; "realism for free" is available to them. For science-fiction films, it's the reward of infinite pains with details.

A hand-painted matte, done on an eight by ten inch blowup, then reduced to regulation 35 mm. film frame size, of the sky, background, flame-effects and the Martian machines was then matched with the live action.

This complicated business is accomplished in the special-effects camera department with large, expensive, custom-built, optical printers under the direction of Paul Lerpae, a veteran in the business.

He has optical printer cameras mounted on lathes with adjustments calibrated down to 1/10,000 of an inch.

It has to be in that great detail. The tiniest mistake made on a single film

frame is magnified two hundred times on a average-sized screen, even more on the new wide screens now coming into vogue.

For "War of the Worlds," the optical-effects department painted between three thousand to four thousand celluloid frames for us.

In one brief flash in the picture an army colonel is disintegrated by a Martian machine. It took exactly one hundred forty-four mattes of his inked-in figure to accomplish this illusion.

But everything I've described so far was just a practice session for the biggest hurdle of them all. The single,



"No, children, they didn't really destroy Los Angeles to make this movie. But my, wouldn't you like to have what they did have to destroy—after months of the most painstakingly exacting efforts!"

most difficult sequence to create in the entire picture was when the United States Army attacked the Martian machines and they fought back.

First we did the easy part—the live action with our cast and the National Guard on location near Phoenix, Arizona. For two days the outfit went through maneuvers while our cameramen shot scenes of them defending our country against Martians.

Then the special-effects boys went to work. First, matte shots of trees

and a command post were made. Then miniatures of a gully where the actors could hide, and the approaching three Martian machines were photographed.

Next the rays and explosions were inserted. After that came the bright yellowish foreground explosions.

In all we had five complicated processes to contend with. At times we made as many as twenty-eight different exposures to get one single final color scene.

For a scene where an attacking tank is disintegrated, we inked in the tank outline on an opaque matte. Then we changed the color to red, then to red-blue. We got a flaring out of sudden flame from the tank by using diffusion glasses. Here was the spot where we switched from red to yellow. Afterwards we photographically "dodged in" the burnt areas around the area where the tank had been.

When the United States forces drop an atom bomb on the Martians we had to come up with a gimmick to protect the invaders in this crisis. Special-effects devised a large, plastic bubble, five feet in diameter.

First, the machine was filmed alone. Then we photographed the explosion and the bubble and superimposed that negative over the first to get the final result.

There was no clearance needed for the facsimile of the atom bomb we used. It was a stunt engineered right on our own sound stage by Paramount's eighty-one-year-old powder expert, Walter Hoffman.

He got his effect by putting a collection of colored explosive powders on top of an air-tight metal drum filled with an explosive gas. Rigged up with an electrical remote control, its second try reached a height of seventy-



To build a perfect miniature house is a job; how they achieved the common, familiar pattern of weatherstaining, though, is probably a trade secret. And it's unquestionably a high art

five feet with the mushroom top of the real thing.

Getting Army clearance was not a major concern in producing "War of the Worlds." We did use a few stock shots from the Northrop and North American Aviation Companies which had to be submitted to the Department of Defense, but it was minor. One of these was a shot of the Flying Wing which we used to carry the atom bomb against the Martians.

While producing both "Destination Moon" and "When Worlds Collide," I had employed the unique talents of artist Chesley Bonestell. I naturally wanted him back for "War of the Worlds." When he came, he served a double role.

A series of his paintings of the planets in our solar system were shown during the prologue with the voice of Sir Cedric Hardwick impersonating that of H. G. Wells in describing why the Martians were forced to migrate from their planet. He explains why Earth was the only one that would do.

Most of Bonestell's paintings were made on canvas of standard size but in the case of Jupiter he painted on glass. He created a mural seven by four feet showing Jupiter's rugged terrain leaving cut-out areas in order that the special-effects department could insert lifelike looking streams of molten lava coursing down the mountainsides.

Bonestell was also our trouble shooter in his role of technical adviser. He's the one who questioned accuracy when screenwriter Barre Lyndon gave the night temperature on Mars. As Dr. Robert Richardson, Mount Wilson Observatory solar specialist affirmed, we have never seen the night side of Mars through telescopes so we can only guess at the temperature. Better cut it out.

Then there was the Saturn incident. The script had presented the planet as peaceful and quiet. Bonestell advised that the bands around Saturn—not the famous rings—appear stormy.

As contact man between us and Mount Wilson and scientists at California Institute of Technology—which we call Pacific Tech in the picture—Bonestell kept us on the right track.

Unfortunately for the straining ingenuity of the creators, you aren't through with a science-fiction film when it looks right. It's got to sound right, too.

Just what does an out-of-this-world cry or noise sound like? Gene Garvin, our dubbing mixer, took on this problem and pondered and tested it for three months.

How would a Martian scream sound? The boys thought a long time on that one. Finally they arrived at the unusual conclusion of scraping dry ice across a contact microphone and combining it with a woman's high scream recorded backwards.

It was the weirdest sound anyone has yet come up with for one of my pictures.

The vibrating, almost singing noise of the machines themselves was a magnetic recorder hooked up to send back an oscillation sound.

The eerie sound of the Martian's death ray was chords struck on three guitars, the sounds amplified, then played backwards and reverberated.

Although it took months to come up with the sounds, once we had them it was a simple matter to record them in the picture.

The nerve strain or co-ordination in a film like "War of the Worlds" is tremendous. Let one department fluff off and the whole result goes floey no matter how the others have knocked themselves out for perfection. You get so wrapped up in your own particular problems and your part of the teamwork that by the time the film is in the can, the whole thing is sort of a haze.

You've knocked yourself out on details and technicalities so that when someone asks you, "Is it good," you can't answer "yes" or "no" for sure. The whole thing is a blur. A conventional picture is considerably easier to produce and judge.

That's why the first sneak preview at the Paradise Theater in Westchester, a Los Angeles suburb, last November had all those who worked on the film slightly off this world's gravity. We'd used our imagination and ingenuity—given it everything we had. Was it good or was it ripe for blasé teenagers' laughter?

It was a fine feeling which the cast and creators shared when the preview cards came in "good." Just to make sure that this favorable audience wasn't an exception, we staged a second sneak preview in Santa Monica. Another top response. Then we really relaxed.

Those Friday night audiences of youths from twelve to twenty-five in jeans and leather jackets are the toughest audiences in the world to please. We were satisfied that, if they took our version of H. G. Wells, we'd made the grade.

Uncurling our fingers, almost arthritic with crossings, the print was shipped to New York. But was it time to vacation? Not by a planetful. Now let's see: If we got disintegration in "War of the Worlds," can we create artificial satellites in "Conquest of Space"? I hope so. It's the next science-fiction film on the agenda, you know.

THE END



HOW TO TALK TO A MARTIAN

Most people speak only one language; few learn any language outside the Indo-European group. Consequently, very few realize the vastly different ways of seeing the Universe a language can use!

BY G. R. SHIPMAN

Of all the stock characters in science fiction that I wish the BEM's would eat alive, number one on my list is the Telepathic Martian.

You know the one I mean. His spaceship lands in an Iowa cornfield one hot July day. The nation panics; a frantic Defense Department throws a cordon around the farm; the yokels take to the woods; reporters and TV cameramen trample on inquisitive scientists; the Chicago *Tribune* gets out an extra to warn us that the whole thing is probably a Fair Deal plot. Then, as the world and his wife sit with their ears glued to the radio, the hatches of the spaceship open and the Martian emerges to tell us he wishes us well and only wants to save our

civilization from self-destruction.

In American English, no less. By some miracle the authors never explain, this visitor from outer space can not only project his thoughts into human brains, but can force them to rearrange his extraterrestrial ideas into the patterns of American speech. Every listener in the surrounding throng hears the Martian's off-the-cuff eloquence in the same way, and not even the most ignorant bystander ever translates a Martian thought-wave by an "ain't" or a "he don't." Given the enormous cultural differences between Martians and ourselves, you'd expect large blank spots where earthy languages have no equivalents for Martian concepts. But no—we al-

ways read their signals one hundred per cent.

Of course there are variations on the telepathy theme. Sometimes the Martian has a walkie-talkie translating machine that picks up his native garglings, whirls them around for a few microseconds in its electronic insides, and sends them out of its loudspeaker in pure United States. Sometimes he seems to have learned English by reading our lips with a super-super-telescope. There may be still other gimmicks I haven't read about. But I have yet to see a science-fiction opus that meets this problem of communication across cultural boundaries head-on and tries to solve it by extrapolating from our present techniques.

The fact is, most science-fiction writers don't know such techniques exist.

At that, the writers are no more naïve than most of the educated public. In this century descriptive linguistics has made such strides that we can already crack the code of extra-terrestrial speech; yet the average intelligent reader has barely heard of the science. People who keep up with modern chemistry and physics can still talk about the study of language in terms handed down from the days when astrology was considered an exact science. They still refer to the study of language as "philology," and have a vague idea that philologists look for "roots" the way a pig looks for truffles. Well, calling the modern

science of linguistics "philology" is like calling atomic physics "natural philosophy"—a subject my grandmother studied, without apparatus, when she was a student at a "female seminary."

Fortunately, the linguists haven't waited to be appreciated. They have simply gone on working while the world choked itself in yards and yards of cultural lag, and one of the reasons we won the war was that they knew their business. Thanks to them, GI's in many remote jungles and on lonely atolls learned exotic languages fast—and were really able to talk to the natives. The technique of learning strange tongues that the linguists had worked out with American Indians was equally applicable to Chinese or Russian, and brought results much sooner than traditional methods.

Some of these same linguists are also anthropologists, for language is the indispensable key to an alien culture. When the time comes to establish communication with Martians or any other race from Outside, the linguistic anthropologists will be the ones who forge the link. If beings from another planet use speech or any recognizable analogue, they will be able to decode it with the same techniques they have used to Salish or Navaho or Kwakiutl. (Those are American languages, by the way.)

The linguist doesn't need any impressive apparatus—only a pencil and

paper, and perhaps a tape recorder. He gets along faster if he has an "informant," a native speaker of the language who has some other language in common with the linguist. There won't be any such informants aboard the spaceship, but, as we'll see later, it's possible to learn Martian without them.

When a linguist works with a human informant, he begins by asking him how to say things like "Good morning," "How do you feel?" "What color is that apple?" and "I'm sure it's going to rain tonight." He writes the answers down in the most exact phonetic transcription possible, with a translation of each phrase. He does this even if the language has an alphabet of its own. Most languages, however, are unwritten, and phonetic script is the only way to record them.

The first few jottings in the linguist's notebook are simply odds and ends, as meaningless as ten answers in a Gallup poll. But as the entries pile up, patterns begin to emerge. By skillful questioning, the linguist wheedles more sentences out of the informant to confirm his hunches about the pattern. After he has filled a good many pages, he has enough material to peel out all the verb-forms, variations of the noun, and relevant categories. He is almost ready to write a grammar.

Not quite ready, though; he first has to be sure of the sound-system. Sounds are usually the first units to be

analyzed, because they are the smallest elements into which human speech can be divided, and because all the rest of his work depends on his understanding of how they pattern. Though the number of noises that human tongues, lips, and larynges can make is almost infinite, no one language ever uses more than a small fraction of them. Moreover, no naïve speaker is aware of all the sounds he makes. He is conscious only of *classes of sounds* that are functional in his language.

To show what "functional" means, let's turn the tables and imagine that a Martian linguist is trying to get the hang of certain American English consonants. His ears and sound spectrograph have recorded a rather large variety of noises made by closing the lips. He might arrange some words containing these sounds into a table like this:

	1	2	3
Voiceless	<i>pat</i>	<i>spat</i>	<i>tap</i>
Voiced	<i>bat</i>	—	<i>tab</i>

All these words contain sounds called *labial stops*, made by closing the lips and checking the breath-stream for an instant. The stops in the first, or "voiceless" row, are made with the vocal cords relaxed. Those in the "voiced" row are made while the vocal cords are tense and vibrating. Our conventional way of writing these sounds is with the letters P and B.

We write the labial stops in *pat*,

spat, and *tap* with the same letter, but to the Martians and their instruments they will not sound exactly alike. The p_1 of *pat* has a puff of breath after the lip-closure that isn't heard after the p_2 of *spat*. If you doubt it, light a match, hold it near your lips, and say the two words, in a low voice but aloud. The flame flickers after the p of *pat*, doesn't it? Perhaps it even goes out. In *tap* we have another variety, p_3 , which is made by closing the lips and banking up the breath without a following explosion. This is an *imploded* stop.

In the "voiced" row the Martians can find only two words; English has no words beginning with *sb*. The b_1 of *bat* is exploded like p_1 , but the vocal cords vibrate while the lips close. The b_3 of *tab* is imploded like p_3 , but again the vocal cords vibrate in the process. You can verify all this with another match.

Now let's suppose the Martian linguist does a little experimenting with these sounds. He says to his human informant, "Pat me," using p_1 . The informant gently strokes the Martian's fur. The Martian again says "Pat me," using p_2 . The informant may notice something strange about the Martian's pronunciation, but again he gives him a gentle pat.

On the next trial, the Martian actuates his vocal cords and says, not "Pat me," but "Bat me." The results are somewhat startling. Instead of

being gently stroked, the Martian intercepts a stunning blow over the head from a blunt instrument. Nursing a dented cranium, he retires to his laboratory and records an important discovery: The acoustic difference between p_1 and b_1 is correlated with a striking (pun intended) difference in meaning, but the acoustic difference between p_1 and p_2 does not affect the meaning at all.

Did you realize the three p 's were different before you started to experiment? Probably not, unless you have already studied phonetics. The reason is that the little variations are automatic adjustments to other sounds preceding or following. We are no more conscious of making these adjustments than we are of using every individual muscle we employ in walking. Thus p_1 occurs only at the beginning of a syllable, p_2 only after *s*, p_3 only at the end of a word. Since one sound never poaches on another's territory, we say the three p 's are in *complementary distribution*.

With b_1 of *bat*, the situation is altogether different. It occurs at the beginning of a syllable in exactly the same relative position as p_1 in *pat*. The two sounds, which are acoustically distinct, are not in complementary distribution but in *contrast*. We are conditioned to respond to their acoustic difference. For us, *pat* and *bat* are two different words, as the growing lump on the Martian's skull attests.

Since a voiceless *p*-sound can contrast with a voiced *b*-sound in at least some positions, linguists sum up the difference by saying that sounds which have some features in common and can contrast with other sounds in the same relative position belong to different classes called *phonemes*—first syllable like “phone”. All the different varieties of *p* are members of the /p/ phoneme, and all the *b*’s belong to the /b/ phoneme. (The slants are the linguist’s shorthand sign to show that he is talking about a phoneme, not one of its members. The members are written in square brackets: [p₁], [p₂], [p₃].)

This phonemic contrast of voiced and voiceless sounds is a pervading feature of English. In the following pairs, the first word begins with a voiceless consonant, the second with a voiced consonant. Otherwise the initial consonants are exactly alike; try it and see:

tame	: dame
came	: game
fat	: vat
Chet	: jet
sell	: Zell

These remarks hold good for English, but not necessarily for other languages. The distinction between voiced and voiceless consonants which is so meaningful to us may not even be perceptible to speakers of other languages which do not have it. Leonard Bloomfield tells us that the Menomini

Indians heard Scandinavian lumberjacks called “Swedes” and translated the word by *sayewenel* “one who is sweet.” In Menomini there is a phoneme that includes sounds like our *t* and *d*. Since these sounds never contrast, the Indians were not aware that to English-speakers *t* and *d* sound quite different. The Chinese, on the other hand, think that our *p*₁ and *p*₂ are quite different, because their own language has contrasts between sounds similar to them.

Unless we understand the phonemic structure of a language, we cannot describe it accurately. A good deal of the English grammatical system, for instance, depends on the contrast of voiced and voiceless consonants. The past-tense ending that we write *-ed* is pronounced like *t* after voiceless consonants. Compare *locked*, *slapped*, with *logged*, *rigged*. Now imagine a Menomini Indian without phonemic training trying to write a grammar of English for his people. He would make a pretty awful mess of the section on the past tense of verbs.

Another advantage of phonemics is that it cuts down the number of sound-features we need to talk about in a grammar to manageable size. Few languages use more than two or three dozen phonemes, but the number of positional variants may be several times as many. Another advantage is that a phonemic—not phonetic—transcription is the best basis for a system of writing. If we assign a letter

to each phoneme, a native speaker will automatically put the variants in the right places. For languages that have never been written, phonemics speeds up the task of making illiterate people literate.

The phonemes of a language are the "bricks" it uses to build up words and sentences. The way these "bricks" are laid together is purely arbitrary. There is no fancy philosophical reason why three English phonemes in one order mean a fish, *shad*, and in reverse order a punctuation mark, *dash*. It just is that way, by social custom. But this combination of phonemes in an arbitrary order enables a language to say a good deal with a limited number of basic elements. The thirty phonemes of my Midwestern pronunciation are enough to build up all the words in Webster's dictionary.

If the inhabitants of other planets use speech-sounds as we do, their language should yield to analysis by our methods as easily as any Earth language. The same would be true if they use any combination of other types of visual, audible, or tactile signals. A language might be based on musical notes of varying pitch and duration. An idealist named François Sudré once invented a language, Solresol, whose entire vocabulary was formed by combining the names of the seven notes of the musical scale, *do, re, mi, fa, sol, la, si*. Solresol, which the inventor hoped would become the international language, could be

spoken, sung, or played on any instrument except a drum. The Mazateco Indians of southern Mexico actually have a "whistle speech" beside their spoken language. Telegraph and blinker codes and the hand alphabets of the deaf-and-dumb substitute electronic impulses or gestures for letters, which in turn represent phonemes more or less exactly. In one of Gilbert K. Chesterton's stories, a professor invented a language of dance steps.

Whatever the "bricks" of Martian language may be, it should be possible to discover them as we discover the sound-patterns of earthly speech. Finding the larger patterns—words and sentences—into which they fit will be the real drudgery. Some languages have grammatical patterns so different from those of European speech that it is quite impossible to draw up a list of word-for-word equivalents. English is a somewhat extreme example of a pattern that is fairly rare. It breaks down its ideas into short units of expression—words—that undergo little change in form to show their relationship. The order of words is much more significant in English than their endings, and changing the order changes the meaning. "The man kicked the boy" is quite different from "The boy kicked the man." Chinese, which has no word-endings at all, is another language where order is supremely important. On the other hand, Latin and many other lan-

guages show relationship by changing endings. The three words *Marcus Mariam amat* may be combined in six ways, but in any order they mean "Mark loves Mary." The only way to make the affection mutual is to change the form of two words to *Maria Marcum amat* "Mary loves Mark."

In still other languages, ideas that we express by separate words are fused into one utterance. Nootka, an Indian language of Vancouver Island, has such a structure. According to the late Benjamin Lee Whorf, Nootka *llihisma* means "the boat is grounded on the beach" and *lashlskiqistama* "the boat is manned by picked men." In many languages, the parts of such expressions have no more independent existence than the *-ed* of English *kicked*.

Look at those Nootka examples again, because we are going to use them to expose the Telepathic Martian for the fraud he is. The English translations of the Nootka sentences are constructed much alike. Both are statements about a boat, and we could formulate them: "The boat is *x-ed* preposition *y*." Our speech-habits lead us to think that the two situations they describe must be something alike because our verbal descriptions of them are alike. Nootka shows that it isn't necessarily so. The parts of the two utterances mean:

llih: "moving pointwise"; hence, traveling as in a canoe."
is: "on the beach"

lash: "pick, choose"

tskiq: "reminder, result"

isla: "in a canoe as crew"

ma: (third person singular ending)

So the first expression means more or less: "It is on the beach pointwise as an event of canoe motion" and the second, "They are in the boat as a crew of picked men" or "The boat has a crew of picked men." Neither of the Nootka expressions contains anything you can dissect out and say, "This means *boat*." The canoe is referred to only by implication.

Now the Indian and the paleface see the same canoe on the same beach. Both could identify it and its picked crew from a photograph and agree that the snapshot recorded the same event. But the two observers, conditioned by totally different linguistic systems, make a totally different set of "abstracts" or "isolates" from the observed event. In our way of looking at it, we have to specify the boat, or canoe, as an explicit element. For the Indian, the fact that a boat is concerned is implied by his choice of certain other elements. *Tlih*, "moving pointwise" has to apply to a canoe, just as "rolled" in English has to apply to a round or cylindrical object. Yet the English and the Nootka formulations are equally clear to another speaker of the same language. To the Indian, our English way of lumping together events that seem totally distinct to him must be perplexing and illogical.

The Seventeenth Century philosophers used to speculate about "general grammar." All languages—so they reasoned—are attempts to translate the "reality" of the universe; a single logic underlies all of them. Our increased knowledge makes it seem more likely that the opposite is true. Languages do not depend on universal logic; logic depends on the structure of languages. *For any human being, "reality" is the sum total of the abstracts his language can make from observed events.*

Here is an example, also from Whorf, of two very different ways of regarding time. All human beings are aware that some things happen later than others. European languages express the "passage of time" in terms similar to those used to describe extension in space. We cut time into units of days, months, and years as we cut length into feet, yards, and miles. Nothing seems more natural to us; we speak of "a long day" and "a long pole." But a language like Hopi shows the analogy is not universal. English says "ten days" and "ten houses," but we can never experience ten days at once as we can see ten houses at once. *Houses* is a real plural; *days* is an imaginary plural.

Now Hopi has no imaginary plurals. For a Hopi Indian, the idea "ten days is longer than nine days" becomes "the tenth day is later than the ninth." He does not conceive of "ten days" as a length of time—see our

spatial metaphor again?—cut up into shorter "lengths" called days, but as the recurrence of a phenomenon in a cycle. Hence a Hopi cannot multiply ten days by two to get twenty days, and the idea of describing time by words that also refer to space or matter would hardly occur to him. In fact, the idea of time as a continuous flow would be quite strange. No Hopi Einstein, uninfluenced by European ideas, would ever evolve the notion of a four-dimensional space-time continuum. His mathematical picture of the universe would have no more in common with ours than a Greek painting has with a canvas by Picasso.

Now, perhaps, you begin to understand why I want to feed the Telepathic Martian and his universal translating machine to the BEM's. If human languages can be so different as English and Nootka, the grammatical categories of Martian speech must be something completely outside our experience. The Telepathic Martian's thought-waves would have to be so powerful that they could make our brain cells aware of logical and grammatical relationships that have no equivalent whatever in our language.

Imagine, for the sake of the argument, that a telepathic English-speaking American and a telepathic Nootka-speaking American sit down for a chat. The only thoughts they could have in common would be mental pictures. The English-speaker might

be able to project an image of his family and his bungalow, and the Nootka might succeed in making the white man visualize his squaw and his canoe. But how does the white man translate into pictures: "I paid off the mortgage on my house last year"? How do you visualize a mortgage to an Indian who barely understands money? Is the mortgage "on" the house the same way the shingles are on it? How do you picture the past-tense notion in "paid" and the concept "last year"?

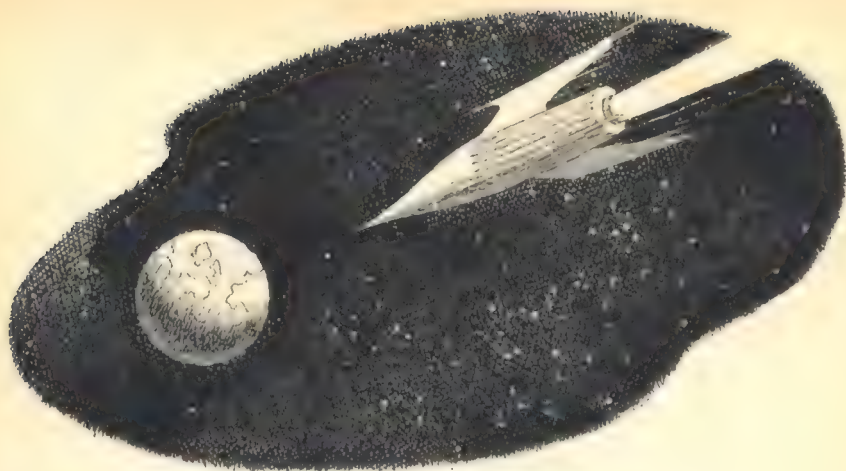
See what I mean? When the Martians land, we'll have to learn their language in the same laborious way we have learned Nootka and Salish and all the rest. Though there won't be any informants on their spaceship, we can teach them a limited amount of English by the time-honored process of *ostensive definition*. This means pointing at a chair and saying "chair," or dropping a brick and remarking "I just dropped a brick." Simple verbs can be acted out, like *eat, wash, shave, cut, scratch, draw, write*. For more complicated ideas, we might begin by verbalizing arithmetical or mathematical statements, like "two and two make four" or "The square of the hypotenuse of a right triangle is equal to the sum of the squares of the other two sides. Presumably the Martians could teach us some of their

language in the same way. It would be slow, but not impossible.

If Twentieth Century science can already suggest a way to talk to Martians, science-fiction writers have an obligation to base their fantasies of the future on the knowledge of the present. Science fiction, to be enjoyed by an intelligent reader, has to be plausible. Recently I read a story that was spoiled for me because of one elementary error. An extraterrestrial character in it spoke English with a phony foreign accent in which all the *l*'s became *s*'s. Yet this outlander, who couldn't manage our *t*-sound, had one in his own name! You don't have to be a Ph. D. in linguistics to see the howler.

In the best science fiction, the gadgets of the future are logical developments of those we already have. Good writers send their spacefarers to other planets in ways that are already known to be possible, and devise imaginary civilizations that follow logically from the conditions we know to exist on other worlds. I hope to live long enough to read stories that cope with the problem of interplanetary communication as realistically as we now do with interplanetary travel. As a first step, I move we bury the Telepathic Martian and his walkie-talkie interpreter under six feet of solid mars.

THE END



THE SCAVENGERS

The Crawlers were fortunate in this; they couldn't put up even a token resistance to the slashing, utterly overwhelming attack of the people from out of space. Their homes, their cities, all of their works smashed, their opposition totally futile—fortunately.

BY JAMES WHITE

Illustrated by H. R. van Dongen

The ship was in a hurry. It flashed through the frigid upper reaches of the atmosphere like a great silvery dart. A dart whose needle prow and stabilizers glowed with the furious, angry red of air resistance, and whose flight path was drawn across the dark blueprint of the sky by a thin, perfectly straight white line of vapor

condensation. Far below it the planetary surface slid by with deceptive slowness.

In the ship's tiny control room a loud-speaker clicked, hummed, and said, "Flagship to S-Five-Three—" The eyes of the three-man crew flickered briefly towards it, then switched back to their respective

instrument panels. A tightness about their mouths and an involuntary jerk of their heads towards the sound betrayed the strain they were under. They relaxed, a little, when it merely stated, "This is the commander. Your ETA over target is nine minutes, fifteen seconds from—now. What have you in mind, captain?"

Spence, the ship's captain, reached out quickly—too quickly—and fumbled the switch to the "Transmit" position. But his voice was quite steady as he replied.

"The usual thing, sir. Direct, high-level approach to within fifty miles, dive, level off at five thousand, spray them, then decelerate and land. Normal procedure from there on in. It should take about two hours."

There was silence for a long moment, broken only by the faint, background hum from the speaker. The miles fled by, a large number of miles. Then the commander spoke again.

"That seems satisfactory, but we are taking too long over this, captain. Hurry it up, please. Have you looked at a clock recently? Off."

Beside the captain, the engineer and servomech officer, Bennett, moved restively. He looked straight at Spence, then at the now quiescent speaker, and inclined his close-cropped, grayish-blond head at two dials on the wide panel before him. The dials showed the hull temperature and the output of the cooling units.

They each bore a conspicuous red mark, and their indicator needles seemed to be glued to these marks. Bennett gave a short, interrogatory grunt. It was his way of saying that if they hurried it up any faster they'd probably vaporize themselves, but it was for the captain to decide one way or the other. Bennett was a man of few words.

Spence shook his head curtly. There would be no increase in speed. Then he turned abruptly to the third member of the crew, Harrison, the gunnery officer.

Harrison was muttering angrily, "What did he mean by that last crack? Have we looked at anything else *but* clocks recently? Just who does he think he is—?"

"That's enough," said Spence sharply, as a light flashed urgently on his panel, "I haven't time to listen to you. We dive in three seconds. Brace yourselves." His hands flickered about, checking, then settled on the twin grips of a lever that grew solidly from the floor between his feet. He began to edge it slowly forward.

The great ship curved smoothly downwards into a steep dive. Straining against the straps, the crew hung forward in their seats, their faces pop-eyed, dark red masks of mounting blood pressure. The dive lasted eight seconds, then the pull-out flattened them back into the padding. That was much easier to take, thought Spence. The seats were designed to

swing to compensate for any sudden change in direction, but on a planetary operation like this they had, of course, to be in a fixed up-down position.

But it wasn't the ill-treatment his body was being subjected to that was worrying him. No, that was the least of his troubles. It was Harrison.

Harrison was going soft.

Captain Spence couldn't altogether blame him. Harrison had been under a killing pressure, both physical and mental these last few days, but this was certainly not the time to develop a hypersensitive conscience.

Harrison had joined the ship only a week ago, just two days before the current emergency, as a replacement for Walters who was still recuperating with a leg graft after that mess on Torcin Eight. He was a new boy, just out of Basic Training, and like all the freshly-qualified entrants to the Force, he'd worn the dedicated, near-exalted look that sometimes took months to wear off. The great motto of the Force, implying the ultimate in selfless service to humanity, was practically written in letters of light across his forehead as well as being traced in gold thread on cap and shoulder badges. It said, in a language long dead before the motto was even coined, "There is nothing more important than a human life," and Harrison was intensely eager to start saving lives. He was going to save

lives if he had to kill himself doing it. Spence had felt the same way at the start, but that idea had been soon knocked out of him. There was no future in it; besides, it was wasteful of highly-trained technicians.

All this did not mean that Harrison had been naive or unrealistic about things. He'd known that the Force must, by its very nature, be called on to do an occasional little job that was just a shade off-color—for the greatest common good, of course. It was a pity, thought Spence, that his first job had been a five-star alarm, a very big one and the grimmest the captain had ever encountered in his twelve years of service. It was one way of finding out whether a man had what it took, but it was a rather drastic way.

Now Harrison was sitting hunched forward in his seat, staring at the screen which showed the surface ahead and below. From five thousand feet the ground was a dull, reddish-brown carpet unrolling monotonously below the furiously speeding ship. Occasionally there would be a stain on the carpet—an ugly black stain five miles across that had been the site of one of the Crawler cities. The ship had been directly responsible for quite a few of those. There was nothing like a medium-sized H-bomb exploded well underground to really *reduce* a city. The shock-wave left the resultant rubble looking like fine gravel. The placing and detonation

of the bombs was the gunnery officer's department, so he was sitting there beginning to hate himself.

Good thing, thought Spence, that the Crawler civilization was concentrated in large, widely-separate cities. It was less wasteful of bombs and made the cleanup job a lot simpler. There were no farms or villages to deal with, but there were groups of survivors, who had somehow managed to evade the first sweep, holing up in various places. It was towards one of these groups, one of the few remaining on the planet, that Spence's ship was splitting the air.

A low range of mountains crept gradually over the horizon. The aliens were behind them. The ship had chosen this course so that the mountains would shield it from radar until the last possible moment, always supposing the Crawlers *had* radar. There was no sense in taking chances. Spence's voice was harsh as he said sharply, "Five seconds to target. Gunnery Officer stand by!"

And, thought the captain, if he flunks it now that he's gone this far, I shall certainly kick him to a bleeding pulp.

The aliens had not got radar, but from bits and pieces of mining machinery they had somehow fashioned a multi-barreled anti-aircraft weapon. It didn't make the slightest difference, they hadn't a chance. A gray blur streaked across the sky. For a split

second they were bathed in a wide cone of invisible radiation. The effect was instantaneous. The group of Crawlers around the gun jerked convulsively as their voluntary muscles reacted to the radiation, then they rolled flabbily to the ground.

And when the lagging thunder of the ship's passage across the sky beat down on the Crawler mining settlement, the ship itself was a shrinking dot on the horizon, and nothing on the ground was moving. It was as easy as that.

The ship decelerated furiously to subsonic and circled back. It hung motionless over the settlement. From the projector under its nose the radiation again flared out; this time it was maintained for fully two seconds, then the ship settled slowly towards the ground.

That second dose was unnecessary, Spence thought, as the surface expanded below them. It was merely another added precaution. There was not a race known in the galaxy immune to that radiation. It really was the nearest thing to the Perfect Weapon ever discovered; it did not harm the body at all, but struck directly at the brain in such a way that the mind affected was rendered completely unconscious, all the voluntary muscles were paralyzed, and the metabolic rate was slowed to almost nothing. Its beauty lay in the fact that it was reversible. If you potted a friend by mistake, he could be

revived. On the other hand, if it was an enemy, you could come back at leisure and burn him, or blow holes in him—he was helpless. The easy way was just to leave him and he'd starve to death.

The trend of the captain's thoughts was becoming too morbid. He pulled himself out of it to find the ship about to touch down. He started doing rapid, complicated things with the controls before him. When he looked up they were down and he hadn't felt it.

"Locks One to Six open. Holds A and B ready for loading," he announced crisply, "Go to it, Mr. Bennett." He sat back tiredly. For the time being he had nothing to do.

Up to this moment the servomech officer had been little more than a passenger, but now he went to work. A stream of robots, functionally specialized, began to walk, roll, or fly out of the opened locks. Some were merely camera pickups, others consisted of a cluster of extensible grabs of various sizes mounted on caterpillar treads, the rest were simply remote-controlled wheelbarrows. The grabs spread out, each trailed by an attentive trio of barrows. When they came to a limp alien, it would be lifted, dumped into a barrow, which would whisk it back to the ship where other types of special machinery would stow it carefully away where it would be sure to keep.

Meanwhile, the grab had moved on to the next alien, and the first barrow, now empty, hurried back to wait for a refill.

At various heights above all this activity hovered the camera pickups, constantly sending pictures and pertinent data back to the semicircle of screens around Bennett's control panel. And Bennett, by glancing at a screen and fiddling with a few knobs, would send several tons of highly-complex machinery where it would do the most good. The robots were almost fully automatic, needing only the minimum of guidance, but keeping his eyes on over fifty of the things was a nerve-racking job.

The captain, watching with approval, thought how efficient it was, and how quick. Bennett was good at this. Suddenly he started forward and snapped a reproof.

"Careful there. Take it easy. What do you think you're doing? They're not sacks of flour, you know. Watch it."

One of the grabs in dropping a Crawler into a barrow had misjudged. Its flaccid burden had fouled a sharp-edged projection on its way in. A great, three-foot gash appeared in its side and the treacly goo it used for blood welled out, making a dirty, ever-widening stain on the beautiful, iridescent fur.

"Sorry," Bennett muttered abstractedly, "I was in a hurry." Which was a pretty good excuse, all things

considered.

The captain kept quiet. A tricky piece of work had come up and he didn't want to distract the other.

It was one of the Crawler gunners. It had been manning the gun when the projector had caught it, and it was practically tied to its post. The Crawler method of operating their machinery was either to wrap themselves around it or to insinuate themselves right into it, or preferably both, so as to use to the best advantage the five pairs of hands and feet which made them so closely resemble the centipede. This one was so mixed up with the gun that Bennett had brought up another grab to help untangle it. But it wasn't until another specialized servo arrived from the ship and partially dismantled the gun that they were able to draw the alien free. While it was being carted back to the ship the two grabs wheeled about and went hunting again.

But game was becoming scarce. On a large screen in front of the servomech officer a dim gray picture of the mining settlement as seen from the air appeared. Here and there on the picture a hot orange spark burned. Each spark showed the position of one of the Crawlers. It didn't matter if they were out in the open or coiled in some dark corner of their low, dome-shaped shelters. They weren't quite dead, so their brainwaves were detectable and their posi-

tions showed plain.

It was another one of the advantages of using the projector—one was able to find the victims without any trouble. When the ship had landed, more than fifty glowing sparks had dotted the screen. Now there were fourteen. Bennett brought thirty of the robots back to the ship, where they automatically sorted and stored themselves away. The job was almost finished and they were only cluttering up the place.

Less than an hour of his estimated two had passed, Spence thought. We've made good time. We should do it comfortably. He began to relax.

Suddenly the wall speaker burst into life again. The harsh voice of the fleet commander pervaded the room.

"Flagship to Scavenger Five-Three. How is it going, captain? Report, please."

Spence took a deep breath, then recited briskly, "Everything going according to plan, sir. We found a sort of mining settlement—the first I've seen here that hadn't a city built over it—with between fifty and sixty Crawler survivors. They had a gun of sorts rigged up but didn't get a chance to use it. We're loading in the last few stiffs now."

He stopped. Bennett was waving at him urgently, trying to attract his attention. Harrison, white-faced, was bending over the other's shoulder

and staring at the servo panel as if he didn't believe it. Spence nodded curtly and said into the mike, "Excuse me, sir. Something has come up." He turned impatiently to the others.

"Well?"

Bennett didn't say anything. He didn't need to. His finger indicated five lights burning on the screen before him. A graduated dial showed the depth of the objects which caused the lights to be two hundred feet. Another gave the information that the objects were in fairly rapid motion. He let his hands fall to his lap and looked gloomy.

There were five aliens on the loose.

This was too much to take. Of all the blind, senseless, bad luck. Spence was too angry to be frightened—yet. He'd expected to be clear of this stinking planet in another ten minutes. Now *this*.

The five Crawlers must have been down the mine both times the ship had passed over. The projector lacked the power to penetrate two hundred feet of solid, ore-bearing rock, so the radiation hadn't touched them. They were down there now, five alien snakes with beautiful, shimmering pelts, each of whose bodies measured two feet thick and eight feet wide. Their feelings towards the beings in the ship were probably indescribable, but they were certainly hostile. Spence's voice shook a little as he related this latest development to the waiting fleet commander. When

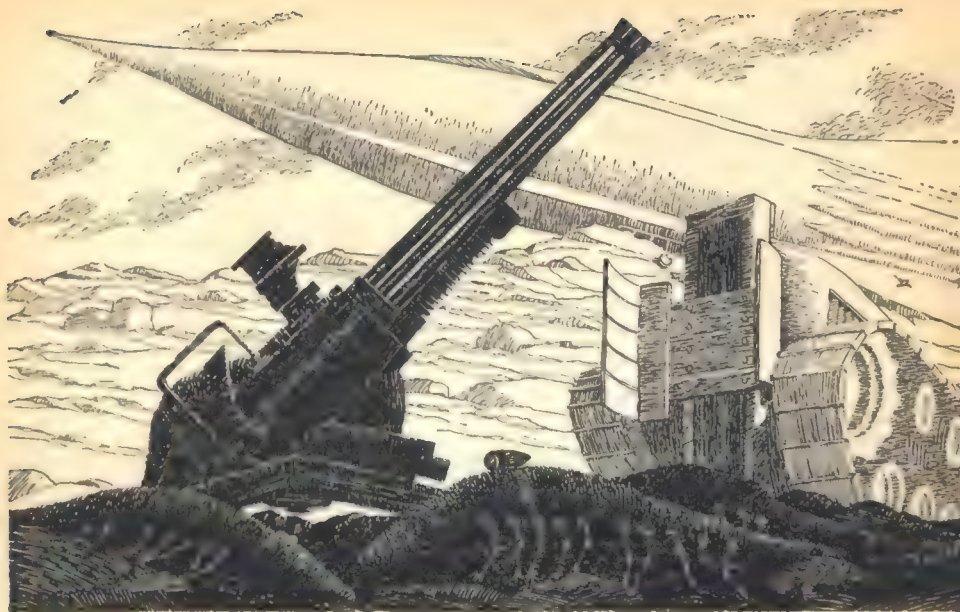
he finished he was sweating.

It was all right while I was busy, he thought, there was no time to be afraid—not really afraid. But this sitting around while the clock ticked off the seconds—He felt almost like asking if the commander had gone to sleep or something, it was taking him so long to answer. He tapped his foot rapidly, nervously against his seat support. When the voice came again he leaned forward anxiously.

"That is bad, captain. Very bad," it said gravely, "but whatever means you use to deal with it, remember that speed must be the first consideration. I will remain in this orbit for exactly fifty-three minutes. You have until then to clear things up." The commander stopped, but he hadn't quite finished. When he went on his tone was just a little warmer and more human.

He said, "I'd better tell you that, if circumstances warrant it, I'll have to leave before the expiration of the time-limit I've just given you. Also, we can't send you any help as you are now the only ship remaining on the planet. When you're through we can all go home. You are last man in, captain. I'll leave you to it. Luck. Off."

Spence had often wondered how it felt to be last man in from one of these clean-up jobs. Now that he knew, he wished that he didn't. But



he had only fifty minutes to get something done. He'd have to think, hard.

But he couldn't think of anything but the fact that far below him crawled the last living things native to this planet, and that his ship was all alone on its whole wide, poisonous surface. He almost felt like blasting off right now, but he had a duty. None of his thoughts showed on his face, they never did unless he wanted them to. His voice was even as he turned to the other two and asked, "Has anyone an idea?"

Harrison shook his head.

Bennett said, "I've already acti-

vated a couple of diggers. They're on the way to the mine shaft now. They will be able to widen the tunnel enough to allow the grabs to get to the aliens. There aren't any lifts to worry about—the main shaft is in the form of a descending spiral with branching tunnels leading off it at different levels. It's very confusing—"

He stopped talking to snap down a few switches on his panel. On a screen before him a monster of flashing and rotating blades mounted on caterpillar treads nosed over into a small hole in the ground. Soil flew skyward. When it had sunk from sight the hole was much bigger.



Other machines hurried in and came out filled with loose earth, then went back for more. Two grabs stood aloofly by, waiting for them to finish.

Bennett went on, a little apologetically, "This isn't such a hot idea, it may take too much time. Unless, of course, we can get them trapped in a dead end, and I don't think they'll let us do that. But I can't think of any other way of doing the job. How about you?"

Spence shook his head, then asked, "How many entrances are there?" He wanted the overall picture before he started making suggestions. Time was too short.

"Just the one," Bennett answered, and waited.

There was probably a very simple answer to this problem, Spence thought, but the terrible urgency of finding that answer so clouded his brain that he couldn't think at all. Performance data of the armaments carried by the ship, together with all the odd items of the Crawler physiology that they'd been able to pick up, tumbled through his mind like a pack of spilled cards, but nothing would make sense. Nothing fitted. And always there was the clock ticking—like a mouse scratching and nibbling away at their dwindling store of time.

He put his finger and thumb to the bridge of his nose and shut his eyes tightly. Steady now, he thought intensely, this is getting you nowhere. Take it easy. *Think*.

Question. How to catch five aliens hiding underground. Answer. Send robots to dig them out. That was logical, and the servomech officer had done the right thing. But any of the robots capable of taking the aliens were too big to traverse the tunnels. If, however, the tunnels were widened, and if the aliens stayed put until the grabs arrived, and if they were unarmed or incapable of damaging the grabs sent after them, then that solution might work out. Spence shook his head impatiently. There were too many "ifs".

Harrison had been figuring out

something on his scratch-pad. He straightened up, looked at Bennett, then bent over his calculations again and began to check them carefully.

Finally he said, "This isn't going to work. The farther down we dig the slower we'll go. The way I figure it we won't even be able to reach the level the aliens are occupying before it's too late." He jerked his head upwards slightly. The movement took in their great flagship hovering impatiently out in space as well as the chronometer on the wall. There was something about the way he said the words, Spence thought. As if he'd been thinking about an entirely different matter.

Spence wondered if the other was getting an idea, and kept silent. Dragging it out of him half-formed wouldn't do any good, he'd spit it out himself if it amounted to anything. Meanwhile, how to get at five aliens two hundred-odd feet underground in a tunnel four feet wide?

All over the ship automatic machinery made small furtive, clicking noises, but the clock above his head sounded the loudest.

Harrison broke the silence. Strain made his first few words an almost unintelligible croak.

"We're going about this the wrong way. Robots are no good for this job. We—We—" He hesitated, then blurted, "We'll have to go after them ourselves."

Nobody said anything for a moment. Spence's mind raced ahead. It might work at that. It just might.

The tunnels were wide enough. They had suits, guns, means of detecting their prey, and this way they might even have enough time. But the crew, or any part of it, wasn't supposed to leave the ship during operations, especially if the ship was a Scavenger Fleet cruiser.

The crew on these boats was small, specialized, and interdependent to a high degree. They carried a thousand-odd cubic yards of near-human machinery which was designed to cope with anything that could conceivably turn up in the way of emergencies, so that the crew need never leave the ship at all.

But this particular situation was without precedent, Spence thought angrily, he'd just have to break the rules. He had a brilliant record up to now. He hoped desperately that nothing would go wrong.

But it was the job that mattered, not the individuals taking part in it. The problem now, he thought, was which member or members of the crew was the most dispensable.

Bennett spoke up, low-voiced and unhurried. He mentioned just how irregular was Harrison's suggestion, but seconded it. He also pointed out that when the robots could not be made to function efficiently, the job of servomech officer automatically became superfluous, or words to that

effect. He ended by confessing to a yen to stretch his legs outside the ship.

Bennett's volunteering for the job beat Harrison's by split seconds. The gunnery officer also gave reasons, good ones—the same ones in fact.

Spence sighed. He'd expected this. He said quietly, "We all volunteer, naturally, but someone will have to stay in the ship. Now," he argued, "two people will stand a better chance out there than one, but we've got to increase that chance as much as possible. The way I see it, Mr. Harrison and myself will attend to the Crawlers, while you, Mr. Bennett, will support us whenever possible with your servos. That way we will all be gainfully employed."

The captain wanted to go, too.

But Bennett had an objection. Supposing something should happen to the captain when he was outside. If he was killed, or injured maybe, what about the ship? The servomech officer couldn't handle it, that he was sure of. The cargo was far too valuable to risk leaving it stranded on the planet in the face of what was coming, or to lose in space because of an untrained pilot. The captain shouldn't go out.

He was right, of course. On a job like this the cargo came first, always. But Spence was annoyed. He showed it by being very sarcastic at first, but the mood left him quickly. This was no time to lose his temper.

"All right, heroes," he said, "get going. You'll need suits. The lightweight type will do here—the pressure is nearly Earth-normal. I'll give you the details while you're climbing in. Hurry it up."

The suits arrived. With rapid, practiced movements Bennett and Harrison dropped onto their backs, wriggled their legs into the lower half, then flipped over and began pushing in their arms. It looked like the donning of long flannel underwear, the hard way. Then came the fish bowls. In eighty seconds they were dressed. Pretty good going. Spence kept talking all the time.

"The air contains about thirty per cent oxygen. It isn't poisonous, exactly, but you'd strangle or burst your hearts through coughing if you had to breathe it for more than a few seconds, it irritates the breathing passages so much. Gravity is point six five Gee, so be careful—" He broke off and said sharply to Harrison, "Check that seam at your shoulder. Is it tight? Slap some cement on it and make sure. No, give it to me. I'll do it. Get the walkie-talkie strapped on."

Dressed, the two men began stretching and bending vigorously, testing for leaks. The captain continued.

"For weapons, better take gas guns and pistols firing nonexplosive bullets. Use the pistols only as a last resort. The reports will probably bring down

the tunnel roof, and we've got to avoid damaging the things if possible. Concentrate on gassing them, we know enough about their body chemistry now to do that. There are a couple of gases in stock that will knock them out like a light. But if something should come up and you *have* to shoot, aim for the center of the twin flaps of muscle which cover their retractable eyes. These are at the top of their heads, which are very heavily boned, almost armor-plated, so don't miss them, the brain is located just behind the flaps. If you should come at them from the side, shoot at their hearts. They have two, located just above the second pair of gripping limbs and the fifth pair of walking limbs respectively. To do a good job you'll have to get both." He paused for breath as the weapons arrived via robot from the armory, then he went on.

"These three spots are their only vital ones. They are nearly all muscle, and you can make them look like sieves without slowing them down very much. Gas is best, anyway.

"Now git, and keep your suit radios on all the time. I'll be listening and I want to know everything as it happens."

Harrison and Bennett ducked out of the control room and made their way through massed piles of machinery to the tiny personnel lock in the great ship's outer skin. Two

knights in shining plastic armor, thought Spence bitterly. He wondered if he would ever see them again. It was times like this that made him have doubts about the Force, and the Force's purpose, and whether it was all worth it.

The commissioning plaque on the wall said that it was. The clock beside it said it was twenty-five minutes before blast-off time, which was more important at the moment.

The captain took the servomech officer's seat. One of the plates showed a tiny picture of the two men sprinting for the mine opening. The sound of their breaths, amplified, came through the speaker. They paused on the brim for a moment without speaking, then dropped from sight.

Suddenly the commander's voice burst in on the silence. He sounded harassed, strained.

"Hello Fifty-Three. What progress?"

The captain jerked nervously. Then began to give his chief an account of the present state of affairs on the planet. The commander interrupted only once to ask incredulously, "*The men are off the ship?*" Then he let him finish.

Spence waited for the other's reaction. He supposed judgment would be deferred until the successful completion of the operation. But if it wasn't successful—He mustn't even think of that.

"You have exceeded your author-

ity, captain. You had no business risking the ship like this, especially with fifty Crawlers aboard," began the commander harshly.

But before he could get warmed up Spence interrupted him with a level-voiced, "My orders were not to leave a live Crawler on the planet."

"I know that, captain. But let's not be greedy." Craig's tone was quiet, almost conversational, but Spence wasn't fooled a bit. The commander was about ready to blow up as he continued, "I've been looking at your record. It's a very good one. Somehow you've always managed to bring home the bacon, if you'll excuse the expression. This time it's different. Don't get overzealous, captain, that's bad. I am leaving shortly. You have another nineteen minutes. This had better work out, captain. Off."

Spence sat up at the mention of the time left to him. The rest of it he could worry about later, if there was a later. Nineteen minutes! What was the matter with Bennett and Harrison, struck dumb or something? Had the aliens sprung a trap, maybe? He was about to call them when Harrison's voice issued angrily from the speaker.

"Stay farther behind, Bennett. You're stabbing me with your suit antenna."

Subdued bumping and scraping noises came from the speaker, and

an answering grunt. Very much relieved, Spence joined in with a faintly sarcastic reproof.

"Bennett. Please refrain from stabbing the gunnery officer. And isn't it about time you told me what was going on down there?"

"Nothing much, sir," Bennett's voice was uneven and a trifle breathless. He was wriggling at top speed along a tunnel and trying to talk at the same time. "We are well past the point in the tunnel at which the digger was stopped. It was a tight squeeze at first, but the tunnel is beginning to widen out a lot. We are about thirty feet above the alien positions. The detector shows four, close-grouped points of mind radiation about one hundred feet to our right and a single point almost directly below us. I expect it's a guard, but I'm nearly certain it isn't aware of us. The tunnel is widening out a lot now, we can stand up. We're going as fast as we can. Harrison is getting ready to knock over the Crawler."

Bennett stopped to get his breath back. Then he went on quickly, "I'll have to shut up in a minute. We're closing in on him fast, and I don't know if these things can hear or not. But seeing as the tunnel is wide enough for robots down here, wouldn't it be a good idea to start the digger again? With all of the tunnel as wide as this we could get some of the bigger 'mechs down here and speed things up a bit. Do you know how to control

the digger?"

A little sarcastically, Spence said yes, he'd been able to pick up a few little things in his twelve years in the Force. He'd manage to do that all right. He pressed the necessary number of buttons and asked was there anything else.

Bennett didn't speak for several minutes. The scuffling noises from the speaker seemed to increase in volume. Then he said, with exaggerated lightness, "Yes, when the tunnel is wide enough you could send down a barrow for this alien. He looks untidy lying here."

Spence was in no mood for levity. "Right, So you got one. Was there any trouble?"

"No, but the vibration from the digger is shaking down a lot of dust. The other Crawlers must know we're here by now. They'll be waiting for us."

"Can't be helped, I'm afraid, but it will be over any time now. The digger is almost through," said the captain. He was about to ask how they were standing conditions down there generally when Harrison's voice cut in. It sounded, thought Spence, decidedly uneasy.

"This looks bad, sir. I'm looking down the tunnel which the alien was guarding. It is perfectly straight, fairly roomy, and it widens to form a sort of room at the other end. The room is artificially lit and there are aliens in it. I can only see two, but

the detector says they are all there. They are working at some kind of machine. I don't like the look of it," he ended and waited for the captain to speak.

Machines, thought Spence, it did look bad. He asked, "Can you tell if the thing is completed or still a-building, or guess at what it's for?"

"No, they're crowding round it. I can't even tell what it looks like. Only parts of it show."

A small pickup drifted into the tunnel beside Harrison and stared glassily over his shoulder. Back in the control room Spence saw the Crawler machine, too. It seemed to be a lot of queerly twisted plates built on four wheels. Baffled, he shook his head. He was beginning to wonder if it wouldn't be better to just pull out and forget the last handful of aliens when Bennett's voice came again.

"The digger's through. I turned it into a side passage and shut it off. And I hear the barrow coming for the stiff. You'd better send a few more down, we might need them in a hurry. Time is getting short, so we're just going to walk down this passage abreast until their room is in range of our gas guns. There's nothing else to do. Judging by the intensity of the lighting they use we might be able to get close enough without them seeing us. I hope so, anyway. Here we go."

The voice stopped. Over the speaker came the measured tread of two

pairs of feet, slightly out of step.

Twelve minutes to go, thought Spence. The barrow carrying the Crawler guard rolled out of the mine opening and headed for the ship. He sent two others down to replace it. After that he never took his eyes off the scene being relayed from the tunnel. But there wasn't much to see, just two shadowy figures outlined by the light at the other end. The image wavered a little as the pickup moved to keep pace behind them.

Despite the intensity of his concentration, the screen couldn't fully occupy his mind. Not enough was happening on it. He kept thinking back. Back an hour, back two days, back a week. But, Spence realized with a start, a week ago he hadn't even heard of this planet. Nobody but a few obscure astronomers had even an inkling of its existence. Then everybody knew. In the same way as some quiet, unassuming neighborhood is brought suddenly into the limelight by a couple of juicy ax murders.

Five days ago the alarm had been given. Every unit of the Force in this sector had lifted itself from its base and made the twist into subspace. When it returned to the normal continuum it was eighty million miles from the Crawler planet and it was part of a fleet of two thousand.

It had been smooth. Not a single hitch anywhere, Spence knew. First

had come the heavies. Twelve hundred fat silver cigars, each half a mile long, had hit the planet in a wave and washed around it twice. The first time they passed, not a single thing moved in the great Crawler cities. The second time took longer—but when they swept by, the cities were empty. Then, their holds crammed with the dominant life of the planet, they had disappeared en masse into subspace.

Then had come the clean-up squad, the Scavenger Fleet. The ships landed in cities which had been cleared of alien life by the heavies. When they took off again the cities blew themselves to pieces in their wake. It was a bit wasteful, Spence thought, using bombs on empty cities, but they had to keep the Crawler survivors from returning to shelter in them. There wouldn't be time to search them twice, because a common enemy would be along very shortly which would lap up Crawlers and humans alike with the finest impartiality.

With the cities out of the way, the Scavenger ships had scattered to route out the stragglers. It wasn't a very difficult job, but they had to hurry it a lot. There was no trouble in finding them. Any Crawler whose mind was working, even if he was asleep, registered on the detectors carried by the ships. Whether they cowered singly in caves or stood defensively at bay a hundred strong in some fortified position, it was just



the same. A ship would flash over. Its projector would flicker invisibly down, then it would land and load the aliens aboard. Dead easy, thought Spence. Nothing to it. Routine.

Up to now, that is, the captain thought bitterly.

He was dragged out of his deepening mood of self-pity by the sight of Bennett and Harrison throwing themselves flat on the ground. Simultaneously the pickup showed the Crawlers moving their machine into the tunnel mouth. Muffled *plops* came from the speaker. The range was still too great, but the men were using their

gas guns. A dirty brown fog grew in the tunnel as the gas combined with the alien atmosphere, blurring the view, but not before Spence saw that the enigmatic machine had started working.

Strangely enough, nothing much seemed to be happening. The machine was being pushed slowly down the passage towards the crouching men, with the aliens sheltering behind it as it crept long. The gas still obscured everything.

Suddenly Harrison's voice crashed out from the wall speaker as he shouted, "It's a fan. We're sunk. They're blowing our gas back at us."

"Stop shouting, Mr. Harrison," Spence said sharply, "I can hear you." The suit mikes were capable of picking up the lowest whisper. When Harrison had raised his voice it had been like sounding the heart of a volcano with a stethoscope. So now the aliens had a fan. That meant his men were powerless to use gas, and using anything else would be too risky, now that they knew of the shaky construction of the tunnel roof.

He'd had about enough of this, Spence decided, it was time to get out.

"Pull out, you two. Back to the ship."

"Captain, I've got an idea." It was Bennett's voice. Low, unhurried, completely sure of himself he went on, "We can still pull it off. If we wait until they're real close and aim for the rotors, we could disable the fans and—"

"No shooting," the captain interrupted harshly, "You'd bring the roof down. And that's an order—"

A loud, vicious, *crack* came from the speaker. The sound was unmistakable. Spence gripped the edge of the panel before him and paled as he saw a few tiny rocks drop from the tunnel roof beside the two men. In a voice that shook with fury he exploded, "Mr. Harrison, I told you not to use your gun down there. If you've—"

"It wasn't us," Bennett cut in. "One of the Crawlers has a sort of

gun. It's sniping at us. And the fan is speeding up, there's a small gale blowing in here now. I think they mean to rush us."

Bennett's tone wasn't quite so unruffled now. Talking rapidly, Harrison took up the troubled tale.

"The way I see it they mean to kill us and get out before the roof comes down completely from the gunfire. It's their mine so I suppose they know better than we do what the tunnel will stand. They're going to risk the shooting and—Down!"

There was another sharp report and simultaneously the screen blanked out. A direct hit on the camera pickup, thought Spence wildly, what a time to go blind. But that wasn't all. There was a close-spaced series of dull crashes from the speaker and the horrible gasping, choking sound of somebody strangling.

"Bennett. Bennett." Harrison was shouting again. A continuous, racking cough, unbearably amplified, drowned out his words.

Spence was reaching hurriedly to turn down the volume when the noise shut off and the gunnery officer's voice returned, low and urgent.

"Bennett's helmet cracked—a rock, I think. I've shut off his transmitter and slapped cement on the break. He's partly buried in the fall. I'm trying to get him free now, but the Crawlers are coming up fast." Harrison stopped as another explosion

shook the tunnel. "Will you send a barrow here so's I can load him aboard. His suit is switched to pure oxygen now, but he looks bad. He's coughing a lot. And can I use my pistol? That Crawler is getting ready to pick me off."

"I can't see down there now. Do what you think is best. You're on your own." Spence answered.

He was beginning to kick himself for sending the men down there in the first place. It looked as if he was going to lose both of them. He thought briefly of cutting his losses and ordering Harrison back immediately, but he knew it would be no use. Harrison was the altruistic type. Besides, he wasn't so sure he could bring himself to abandon Bennett like that anyway. Maybe he was going soft, too.

Two more reports boomed from the speaker in rapid succession, Harrison's voice came again.

"That Crawler's finished. So is the fan, he fell into it when I shot him. It's . . . it's made an awful mess. I'm gassing the others now. There wasn't much of a fall this time, though our guns make a bigger racket than theirs." He paused, his breath coming loud over the speaker. Then he said, "I can hear the barrow coming for Bennett. Send the other one in here while I get him onto this one. Maybe we can get a few Crawlers out after all."

The captain began talking rapidly. He told the gunnery officer not to be

a dope. He used even stronger language. Harrison was to forget about the Crawlers. When the barrow arrived he was to pile in with Bennett and come up at once and not be a complete fool. Spence was beginning to repeat himself when a low, ominous rumble sounded, and the floor beneath him quivered slightly. Only then did he realize that Harrison had his transmitter turned off, and possibly his receiver, too.

"I'll break every bone in his body for this," Spence fumed helplessly. "What a stupid trick to pull. What if he had been calling the other names, it was for his own good." Spence was very worried about Harrison. He was new, he might do something very foolish, his voice had sounded funny just then, come to think of it.

When Harrison switched on his set and spoke, the captain knew that he hadn't been worrying for nothing.

"Bennett is on the way up. I want to stay here for a bit. There's been another fall, a bad one. The Crawlers are all mashed up. It would take a bucket to load them onto anything, they're all over the place." For a moment Harrison sounded as if he was going to be sick. Then he recovered and went on, "But the detector shows one of them to be still alive, and I'm going to get it if I have to drag it out myself. You see, these last few days have gotten me down, captain. I'm sick of this job. I keep remembering things. All those cities

we bombed, and that time the Crawlers came out of that cave and tried to contact us by drawing math symbols on the ground, and the way we gassed them without even acknowledging their signals."

"But we hadn't time," Spence argued. "You know that. And the only telepaths good enough to mesh with them were halfway across the galaxy, and couldn't have reached here in time to do any good. We had to make it a surprise attack or nothing."

"I know, I know. But we didn't even—" Harrison couldn't put it into words. He knew he was right, but the captain was right, too. He changed the subject. "How are we for time, sir?"

"Six and a half minutes," replied Spence, and thought incredulously, *six and a half minutes!*

Just then Bennett came into the control room, still wheezing and smothering an occasional cough. He wasn't much the worse for his near strangulation. Spence nodded at him without turning, and thought angrily that this was mutiny. All he said was, "Harrison. Bennett's here. Come back at once."

Harrison apparently didn't hear him. He said, "That's good." Whether he meant the time or Bennett was an open question. Then he went on in a low, conversational tone, "More stuff is coming down, mostly in the side

tunnels which aren't very strongly built. I'm standing beside the alien which the detector says is alive. Funny thing. I tried to drag it out just now and it came to pieces in my hands. I don't get it. The detector says it is alive, but which piece of it is alive? I'm going to have a closer look—"

Harrison was beginning to talk to himself, thought Spence. That was bad. Next thing he'd begin to scream or laugh, and then he'd want to take off his helmet for a smoke. Quietly, coaxingly, the captain began repeating over and over the command to return to the ship, trying desperately to get hypnotic control over the mind that was so far gone that an appeal to reason was useless.

Suddenly Harrison said in a pleased voice, "Well, what d'you know," and burst out laughing.

The captain's eyes looked bleak. He signaled for Bennett to warm up the drive elements. He would try just once more.

But he didn't get the chance. The fleet commander's harsh voice burst in on them, wavering and fading in the way peculiar to a signal that is being transmitted from a ship in subspace.

"Flagship to Scavenger Five-Three. Report please—" The voice broke off as the commander gasped in unbelief, then he shouted urgently, "You're still on the planet, captain. Get off! Get off at once!"

The captain jumped to obey, but his hand froze on the firing key as Harrison's voice came again. It said simply, "I'm coming now, sir."

For seconds that seemed like an eternity the captain fought to reach a decision. Voices were shouting in his head about Service discipline, common sense, safety. Urging him to take off. Other voices were telling him to be a human being for once, instead of a soulless machine. He looked appealingly at Bennett, but the servomech officer wouldn't meet his eyes.

Bennett pointed suddenly at one of the screens. It showed the tiny figure of Harrison emerging from the mine shaft and sprinting for the ship. On one arm, from wrist to elbow, Harrison wore a beautiful, iridescent fur muff.

When Harrison burst into the control room the great ship was already climbing. He had time to get to his couch and settle his burden gently on his stomach before the acceleration started building up, then he couldn't move.

"Seventy-five seconds," Spence whispered, "Oh, come on, *Come on.*" It sounded almost like a prayer.

Slowly the air around the ship thinned. The huge, pock-marked sun, its corona clearly visible, glared in at them through the starboard screen. The sky was black. They were in space, the warp drive could take over.

Twelve seconds after they had

twisted themselves into the safety of subspace, the furiously expanding sphere of annihilation brought about by the detonation of the system's sun vaporized the Crawler planet.

Harrison lifted the furry bundle and shook it in the air. "I found it underneath one of the dead Crawlers. It's a youngster. Cute, isn't he?"

"Cute, he says," said Bennett in disgusted tones. He choked, and a fit of coughing took him.

Spence said, "Better put it in suspended animation with the others. This air of ours is bad for it."

He was pleased with Harrison. The gunnery officer was going to turn out all right. Unavoidably, they'd had to kill a few aliens, but Harrison had been able, personally, to rescue one of their young, so that more than made up for it. He had no intention of resigning now, Spence knew; he probably felt quite a knight in shining armor.

The captain had felt that way when he was a new boy, he remembered. Somehow, the feeling never quite wore off. It came of belonging to an organization dedicated to the job of protecting, assisting, and keeping the noses clean generally of every race in the galaxy that walked, wriggled, or flew and had intelligence. We're just a flock of space-going guardian angels, he thought a little cynically, all we need are halos.

He came down out of the clouds

with a start to hear Bennett saying, "You know, I'd hate to have the job of explaining all this to the Crawlers when they wake up on their new planet. I wouldn't be a telepath for anything, too dangerous, for one thing—"

If a planet of the pre-nova stage sun is found to contain intelligent life, the Force will assemble an adequate number of transport units to evacuate the planet in question, having first

informed the natives of their danger through operatives of the Department of E-T Communications.

Should no ETCOM telepaths be available at the time, the natives must be evacuated forcefully and taken to the planet assigned them by the Department of Colonization, where the situation will be explained to them when they are revived.

From the "Force Handbook," section on Special Duties.

THE END

IN TIMES TO COME

Astounding seldom runs photographic covers; years go by with none breaking the series of paintings. We've had one this year already; next month we have another. This one, however, is unusual in another way; it is a picture appropriate indeed to the essence of science-fiction's philosophy—yet it is simply a picture taken from our New York office window.

Some few of you who read this, authors and readers who've happened to visit at the office, will understand what I have in mind; the rest can have fun speculating how the above statements can be true.

The lead story will be "Trade Secret," by Raymond F. Jones. Ray Jones seems to have been inspired by the recent "Improbable Profession"—and also by his wartime experience in the patent department of a major electronics firm. The physicist-psychologist team of "Noise Level" is back at work—and this time their noise is directed at the United States Patent system . . . and the noise somewhat resembles a Bronx Cheer.

Also coming is an article by Dr. Gotthard Gunther, on a genuinely new approach to the problem of multi-value logic. Dr. Gunther's "logical parallax" idea is, currently, causing intense interest in professional mathematical-logic schools. And, surprisingly, it makes simple, ordinary, everyday good sense! Most such logic discussions I've found somewhat hard to distinguish from the angel-on-the-pin type. This one isn't; it makes sense of something that is simultaneously true and not-true!

THE EDITOR.



THE REFERENCE LIBRARY

BY P. SCHUYLER MILLER

"MAN IN SPACE"

In the factual literature of space and man we are going through a process which I suppose is characteristic of most growing sciences.

First have come the technical works—isolated papers in professional magazines, pedantic monographs which only the specialists see—in general, reports on research and theory. From time to time have come fragmentary generalizations and popularizations, in fact or sometimes in fiction, translating the technical literature into more popular terms. Finally, as the field begins to take form, the basic structure of theory and clothing of data

seem definite, we get works like Willy Ley's now-classic "Rockets . . ." which sum up the whole subject as of the moment, clearly, competently, and comprehensively.

What Willy Ley has done for the rocket in space, Heinz Haber is now attempting for man in space. His book, "Man In Space" (Bobbs-Merrill Company, Inc., Indianapolis. 1953. 291 pp. Ill. \$3.75), sums up in popular vein some or most of the information which has been contributed by him and others in such technical books as "Physics and Medicine of the Upper Atmosphere." It is a good, sound job which should be seen through several constantly improving

editions, as has been the case with Willy Ley's "Rockets."

Heinz Haber is a German scientist, now in the Department of Engineering of the University of California, who has been working as a physicist and astronomer in the United States Air Force School of Space Medicine. His section of the above-mentioned "Physics and Medicine of the Upper Atmosphere" dealt with the anti-physical concepts of weight developed in that research—the idea that weight, as man knows it subjectively, should be taken as the resultant of all forces acting on his body at any moment. At the moment, I feel my weight through the seat of my pants which is being compressed by the chair on which I am sitting—but if I try to chin myself on the door (which perish fabbit at 93° F!) this will be converted into a tension in my arm muscles and a mixture of compression and pain in my fingers, hooked over the sharp edge of the door.

To the man in free fall, all outside forces balance each other and he is weightless, even though the physical product of his mass and the gravitational acceleration (the physics-text definition of weight) may be substantial.

Since such books as this are published for the general reader, they must of necessity go over much ground which is familiar to the specially informed—which in this case includes most science-fiction readers, and cer-

tainly nearly all ASF readers. "Man In Space" is very well organized as such an introduction. It sketches in our knowledge of the atmosphere, its characteristics and its bounds: things about which most people have some firsthand knowledge and concepts. Next the nature and principles of the rocket and of such rocket planes as the Douglas *Skyrocket* are filled in, with the considerations which make interplanetary flight possible.

At about page 100 the author, with these introductory matters out of the way, gets down to man the space-rover and what we know of his reactions and behavior under the forces which will control him during flight above the atmosphere or in space itself. Here the significance of the physiological definition of weight appears.

This last two-thirds of the book is certainly required reading for anyone interested in space flight. Much of it will probably be familiar from stories and other articles: here it is all spelled out, step by step, very clearly and very simply and thoroughly, and there are points which have been anything but evident in the scientific treatment of the subject. What happens to a man under the crushing weight produced in the great Navy centrifuges is described in the chapter entitled "G's" (maybe the effects of centrifugal force are old stuff, but do you know about the strange illusion of rotation which occurs at high

weights?). Do you understand the mechanism of man's several senses of orientation, and how weightlessness will affect his subjective picture of the state he is in? Have you thought about the peculiar path a falling pencil must take in a space station which is spun to produce weight in its occupants?

Certain stereotypes of the space story are destroyed by this consideration of what man is and what he can do in space. For example, we write and paint pictures of the spaceman observing the sun and its corona in a void without masking air and powdered with hard, bright stars—but, as we should all have seen at once (did anyone?), the human eye will accommodate for the sun's unshielded brightness, the pupil contract to a pin-point, and the fainter stars still won't be visible until you shield your eyes from the direct glare of sunlight. (Read the section around page 233 for this point.) Even the Earth or sunlight sections of the space station will be bright enough to blot out the stars.

And (page 255) have you thought about the possibility that (how often have we guffawed at ignorant writers who suggested the same thing!) the heavy nuclei in cosmic rays may actually *hurt*—a pricking or burning sensation—if they happen to plow through a pain receptor? That they may produce “spots before the eyes” by blasting holes in the retina of the eye?

A book as good as this should be just a bit better. The illustrations are dashy sketches in the Gamow manner, but not as original or successful as Gamow's: “Man In Space” deserves and I hope future editions will have as clear and graphic charts and diagrams as the tiny “Space Medicine” in which Mr. Haber also had a hand two years ago. The jacket is very eye-catching, however: let's keep it.

There are liberal quotations from very current sources, but no direct references which the reader can follow back directly to the source for further study. The book is of the dogmatic “this is how it is” type which simply states facts and findings without trying to document them. And there is no index—a fault of the publisher, who probably thought one would scare off the general dues-paying reader.

All in all an excellent basic book which seems to me to be comprehensive for the time, and which I sincerely hope will go on into later and thoroughly revised and improved editions, as Willy Ley's parallel classic has done. The two books would make ideal companions on the shelf.

AWAY AND BEYOND, by A. E. van Vogt. Pellegrini & Cudahy, N. Y. 1952. 309 pp. \$3.50

The nine stories in this book and the ten in last year's “Destination: Universe” make up the original “Away and Beyond” which was to have come from Arkham House be-

fore publication costs began to get out of line. All but one are from this magazine.

The critics who insist that van Vogt is preeminently a short-story writer certainly gain real reinforcement from a book like this. The ideas are as good, the action develops faster and more tautly, and there is less of the superman mystification which has become identified with the writer's novels. In fact, only one story in this collection, "Secret Unattainable," leaves the secret in question unattainable to the reader as well as to the Nazi overlords who were tempted by Herr Professor Kenrube's invention.

The collection opens with "Vault of the Beast," available in various anthologies but just as good as it ever was. Next comes "The Great Engine" with its glimpse of a strange technology, seen from outside the circle that produced it. Third a rather minor and very short item, "The Great Judge." Fourth, the very long Nazi opus, "Secret Unattainable," which read better in 1942 than it does now.

Not so "The Harmonizer," a delightful little item on the theme of war and what Disney seems to be calling pixie-dust. It's one of van Vogt's best. "Heir Unapparent" is another struggle of world dictators, using a typically van Vogtian force created for the occasion, the Contradictory Force.

"The Second Solution" is another of my favorites—one of the Jamieson-

Rull-ezwal series (which should have been reprinted all together, not scattered as they have been—paper-book publishers please note!), in which a ravaging, vicious ezwal pup is loosed in the Canadian arctic, to be slaughtered or caught alive. So is "Film Library," since I worked with educational films for two years and know how the average teacher would react to a film-from-the-future received in place of a suitably dull but hewn-to-the-curriculum reel.

Finally, in "Asylum," we have the remembered efforts of the Dreegh, galactic vampires, to feed on enough human blood and life-force to replenish their strength before they are caught by the galactic overseers. It offers a superman more believable than some of van Vogt's other heroes.

A bargain, unless you actively dislike van Vogt—with few of the foibles which his detractors point to with distaste.

BALLROOM OF THE SKIES, by John D. MacDonald. Greenberg, New York. 1952. 206 pp. \$2.75

Again, we're owned. Again, a superman is found to use his un-understood dark talents for humanity. But this time it's a little better done than it has been of late.

By 1967 the United States has been reduced to second-rate status by World War III. Dake Lorin is idealistically trying to work for an international balance which will save his

country from total submersion, and the world from another war. The man who is his ideal seems to betray everything for which they have been working. He tries to reveal the sell-out—finds himself referred to a crime-baron—is involved with a beautiful girl of remarkable mental powers—and finds himself a student in a strange school among the stars.

Since the secret of this school of worlds, the importance of certain Earthmen to galactic civilization, and the philosophy behind the plot and counterplot on Earth are the theme of the book, they cannot be revealed here. Enough to say that the motives involved are at least as controversial as the ending of Williamson's "Humanoids." Maybe there'll be discussion over them.

THE GOLDEN APPLES OF THE SUN,
by Ray Bradbury. Doubleday &
Company, New York, 1953. 250
pp. \$3.00

It is a little perplexing to see reviewers expressing their confusion over the "fantastic" elements in a book by as meticulously careful a writer as Heinlein, and going into ecstasy over Ray Bradbury's poetic fancies.

I am not gainsaying for one moment that Bradbury is the most original talent to develop from the fantasy field. The only comparable figures I can recall have been Merritt and Lovecraft, both of whom may turn

out to have been more influential, since Bradbury is too individual to imitate—though he may be said to imitate John Collier and "Saki."

"The Golden Apples of the Sun" contains only a few stories which can be considered science fiction. "The Fog Horn" is the one about an ancient sea-monster which comes to the mating call of a lighthouse fog horn. "The Pedestrian" is a grim little vignette of our mechanized near-future when the deviationist who likes to shut off his radio and television and walk alone in the deserted streets must be stamped out. "The Murderer" is a more violent soul who takes to smashing the mechanisms which hem in his life.

In "The Wilderness" we have an episode from the "Martian Chronicles" sequence: women, full of doubts and fears, setting off as brides to Mars. "A Sound of Thunder" is one of Bradbury's closest-to-traditional time-travel tales: a carefully regulated hunting expedition to the Cretaceous, in which one butterfly too many is crushed. And the title story is a poetic fancy of a ship which tries to snatch up the substance of the sun itself.

There are a few of the pure fantasies which first gained Bradbury critical attention—I still consider "Dark Carnival" his best book. "The April Witch" is a delicate tale of the plain witch-girl who can find love by seeping into another's body and brain. "Invisible Boy" is a pathetic little

story of an old witch whose powers have gone astray. "Embroidery" may be read as a glimpse of three Norns sewing or a vignette of atomic death. Willie, in "Hail and Farewell," is a boy who is always twelve and who must drift from foster-home to foster-home as his failure to age grows queer.

The rest are little glimpses of people today, ordinary people whose reaction to the pressures of life is poetic and strange. In a way their closest skinship is to the people in Steinbeck's "Tortilla Flat," though Bradbury's are shadow-people, tortured and wispy, touched for just a moment by the finger of light from Bradbury's words. A quiet Mexican is deported ("I see You Never"); a traditional baseball game between hotel guests and the Negro servants almost turns "wrong" ("The Big Black and White Game"); a mountain woman gets mail from all over the world ("The Great Wide World Over There"); a desert power station gives a woman a sense of kinship with the world ("Powerhouse"); an hysterical woman is quieted ("En La Noche"); fashion photographers are outwitted ("Sun and Shadow"); the watchman in a Hollywood lot fights against the scraping of his fantastic world ("The Meadow"); a garbageman begins to think of the implications of his Civil Defense duties ("The Garbage Collector"); a young girl is in love ("The Great Fire").

There will be an objection from



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some readers that the people in these scraps of fancy are all the same. That, perhaps, is just what Ray Bradbury has to say to us—that is our own house, down the street, back in the hills, in the mythical China of “The Flying Machine” and “The Golden Kite, The Silver Wind” or the future of “A Sound of Thunder,” among the witch folk or the simple villagers, people are and will be the same, and that emotion—their emotion—can never be divorced from what happens to them.

FLATLAND: A ROMANCE OF MANY DIMENSIONS, by Edwin A. Abbott. Dover Publications, New York. 1952. 103 pp. \$2.25; paper, \$1.00

This classic development of the idea of dimensions first appeared in the 1880's. Its author, “A. Square,” was a schoolmaster and classicist who used the medium of a mathematical—indeed, geometric—romance to propose a paradox in dimensions, and to put over some social satire.

“Flatland,” as you must remember, is a world in one flat plane. Its people are geometric line-figures who cannot imagine a third dimension. Women are straight lines; workmen and soldiers are isoscles triangles; the Middle Class is made up of equilateral triangles. Professional men and “gentlemen” are squares and pentagons, the nobility are hexagons, and the priesthood are circles. There is, it appears, natural built-in social evolution: the

son has one more side than his father.

The consequences of all this social geometry Mr. Square has explained very fully: scent, touch and color seem to be the ways of telling the classes apart, since they all look like lines to each other—only we, above them in a third dimension, can see their true shapes.

Square was not, however, untraveled. In the latter part of the book he attempts—in a dream—to explain two-dimensionalism to the Monarch of Lineland—a one-dimensional world—and in turn has the three-dimensional world explained to him by a visiting cross-section, sees the no-dimensional Pointland, and of course is then locked up for his mad heresy.

Here, so far as I know, is the root of all the host of fourth-dimensional stories which have followed—Square didn't go quite that far.

WEST OF THE SUN, by Edgar Pangburn. Doubleday & Co., Garden City. 1953. 219 pp. \$2.75

Unless some author-publisher combination comes through in a big way, “West of the Sun” is going to be the best science-fiction novel of 1953. To boot, it's an original, which you won't find in any magazine on your shelf. That makes it a “must.”

There is no great originality of plot or theme in Mr. Pangburn's novel, but then there rarely is in the top-notchers—with “Rogue Queen” an exception. A shipload of people have

spent eleven years in space in the search for an Earthlike planet to relieve the pressing population of the home planet. They find it, crash, and set about establishing themselves on the new world, Lucifer.

Lucifer has two intelligent races of its own—swarms of red, bald pygmies with a bloody, Neolithic or Mesolithic village culture, and solitary, furry giants who lead a quiet food-gathering life in the forests. There are natural enemies, too: vicious vampirelike cave-dwelling beasts from the hills, and ravening ratlike predators which attack in lemminglike hordes.

The people—four men, two women—learn to communicate with the giants and the red mites, who have an almost antlike matriarchal society. They try to build a society involving the three races, in which mankind, through their own descendants, can guide and lead the native peoples. Routed in a pygmy war, shaken by the defection of two of their own number, they find a new Eden on an offshore island and begin to rebuild.

Somehow, although the six people do not especially stand out as individuals, there is an overall air of verisimilitude about the whole story. If not individuals, they are recognizable, believable stand-ins for Mankind. And if the humanoids of Lucifer are too human for true realism, they, too, are somehow likable and believable. The atmosphere of the book is close to Lewis' "Out of the Silent



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Planet." I hope Edgar Pangburn writes more science fiction from time to time and takes some of the stereotypes out of space.

ONCE UPON A STAR, by Kendell F. Crossen. Henry Holt & Co., New York. 1953. 237 pp. \$2.95

A good deal of science fiction—perhaps the greater part—is written and published purely as entertainment. This is as it should be, as even Philip Wylie must acknowledge, since he continues to write and sell his highly entertaining yarns about Florida fishing without visible concern about their failure to remake human society.

Kendell Crossen's stories about the Thirty-fifth Century insurance trouble-shooter, Manning Draco, have appeared in another magazine as popular future-adventure tales. In each one Draco, through ingenuity and a lot of good luck, manages to untangle a seemingly hopeless mess brought on indirectly by the greed of his employer, the Greater Solarian Insurance Company, Monopolated, and directly by a couple of its less scrupulous intergalactic agents, the Rigelian scoundrel Dzanku Dzanku and his Terran straight-man Sam Warren.

Four of the stories have now been hitched together and called a novel, although the only vestige of continuity is Draco's running campaign to break down the resistance of his boss' Martian receptionist. In Act

One, "The Merakian Miracle," semi-superman Draco outwits Dzanku (who has sold life insurance—at a neat commission—to a race whose chief goal is dying, and being promptly reincarnated to enjoy the fruits of demise) by reading the Rigelian's mind. In Round Two, Dzanku gets himself instated as pro-tem emperor of Alphard VI. Again skulduggery is used to combat skulduggery—this time in a game of four-dimensional chess.

In Act 3, "The Polluxian Pretender," Draco is aided by an FBI alligator in an attempt to rescue Dzanku, who is convicted of 7,826 violations of Polluxian law, and finds himself affianced to a reptilian princess. Finally, in "The Caphian Caper," our hero has his closest squeak when Dzanku, as "Great Gray Father" of the bat-people of Caph II—where he has set up a social order based on soap opera and TV western movies—has Draco *and* the boss' daughter hunted down as "The Public Enemy" and "The Gangster's Moll."

THIS ISLAND EARTH, by Raymond F. Jones. Shasta Publishers, Chicago. 1952. 220 pp. \$3.00

This novel, rounded out from the magazine stories, starts out as a George O. Smith puzzle-yarn of the "Venus Equilateral" school. Cal Meacham, electronics engineer, gets a handful of "impossible" capacitors—impossible in that they have been

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produced by a quite unearthly science and technology. He gets a catalogue full of equally weird devices, and sets out to build himself something called an "interocitor" with nothing but the catalogue and 4,896 unfamiliar parts.

Whether this theme could have been spun out to greater and greater mysteries, with the eventual revelation that the interocitor is a sort of aptitude test given promising scientists and engineers by a group calling themselves the Peace Engineers, is a moot point. It seems to me that this would have been a better—though possibly less popular—book if that

had been done.

But once Cal Meacham has made contact with the Engineers and installed as boss of their interocitor plant, the question arises who—or what—they really are; and this, in turn, raises a problem similar to that in Williamson's "The Humanoids."

It's hard to explain why "This Island Earth" seems to thin out after a promising start. I hadn't read the magazine version, so it isn't familiarity. Perhaps it's because three quite different—though smoothly related—*kinds* of problem for our hero to solve destroy the unity a novel needs.

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BRASS TACKS

Dear John:

I'd like to say a word concerning Mr. Williams (ASF April 1953) and the doppler effect. I refuse to speculate about the seriousness of the doppler effect at the velocity of light, because I don't think the spaceship will reach this velocity, and say so in "On Atomic Jets," which should appear in a future issue. But the doppler effect sure will make reception difficult, especially in the interstellar case. The bandwidth can't be increased to allow for it; that would let in too much noise. Thus, the receiver has to be tuned to allow for the shifting frequency. Automatic frequency control should take care of this. But, how do

we find the signal in a hurry? We don't, unless we know the relative velocity between transmitter and receiver as well as the transmitter frequency.—J. J. Coupling

And they'd really have to be able to tune that receiver! What started out as microwaves would be coming in on the broadcast band!

Dear Mr. Campbell:

This is in response to both your recent editorial, "The Fallacy of Null-A," and to Mr. Schott's speculative thoughts on speculation, in the same issue. I am inclined not only to agree with your contention that all

communication is of a "yes-no" nature—even though we do communicate tones and shades of meaning—and Mr. Schott's assertion that "speculation cannot be published"—but to add a correlation between the two: Because communication is Aristotelian, speculation—or pure thought—cannot be published.

For purposes of argument, let us define "published thought" as "almost thought." *Almost*, of course, means *not quite*. And thoughts are something that cannot quite be put into words, and still retain their original meaning. The process of changing pure thought, if it exists, and I believe it does, to black marks on a white page is a process which can never operate at what a scientist would call one hundred per cent efficiency.

First, a thought is born—or occurs—or finds a mind to think it, if we choose to be metaphysical—depending on the individual's personal philosophy and interpretation of just what *thought* is. The thought, immediately, is colored by the individual's previous experiences, and at that instant loses some of its purity. Then comes the mental forging on the anvil of Language—a process which is Aristotelian to the *n*th degree: to use or not to use a certain word—and again the thought is changed, mutilated, to a greater or lesser degree.

But finally, it makes its way, battle-scarred and scarcely recognizable, to the fingertips of the thinker, and hence

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from pen or typewriter to paper. *Voila!* One would think the process would be complete, but sadly, it isn't. The thinker, foolishly, wants to pass on his thought to others, so through some mysterious process, involving a possible editorial change and with or without an error on the part of the linotype operator and proofreader, it emerges in printed form.

Then comes the ultimate reader, whose interpretation of everything *he* reads is colored by *his* experiences and the condition of his liver. Naturally, the thought he gleans from the printed page is seldom, if ever, the thought that existed momentarily in the mind of the thinker. In fact, it is exceedingly fortunate if he gets *almost* the same thought. Hence the definition, "almost thought."

Consider again the step-modulation system of television transmission. If, at the transmitting end, seven steps of equal difference in light intensity are perfectly registered and perfectly transmitted, and in the receiver the *rf*, *if*, and video strips are operating with perfect linearity, the received picture should be an exact replica of the transmitted image, which above was perfect. I think you will agree, though, that *exact* matching of *all* components is *almost* impossible. Therefore, if we are lucky, the result is *almost* the same picture.

And if the reader is lucky, he gets *almost* the same thought the author started with.—Larry Maddock, 315

Canal Street, Eaton Rapids, Michigan.

In other words—there is noise introduced in any communication channel.

Dear Mr. Campbell:

James W. Wilber's letter in the April issue very nicely exposes and corrects one false assumption usually made about athletics on the Moon. Unfortunately, he keeps the other. His calculation assumes, as usual, that a jumper's legs would not move any faster under the reduced load than they do on Earth, so that he would take off at the same velocity, his c.g. rising six times as high. Wilber's later suggestion holds the clue, of course. How *fast* can a man jump under reduced gravity?

I prefer to calculate a standing, rather than a running high jump, because it is much simpler. In the running jump, the athlete converts some of his forward motion into upward, by using his leg as a vaulting pole. This is so effective that he can jump higher this way than from a standing start, even though he takes off from only one leg, and does not crouch nearly as low.

Suppose Mr. Wilber's 180-lb., 6-ft. athlete can raise his c.g. $2\frac{1}{2}$ ft. from a standing start. He first crouches down about $2\frac{1}{2}$ ft. The average force his legs exert through that distance gives him an acceleration of 2g. That is, 1g. to support 180 lbs., and 1g. to

lift 180 lbs. another $2\frac{1}{2}$ ft. Accordingly, if he were on the Moon, weighing 30 lbs., he could jump $6 \times 2\frac{1}{4} = 15$ ft. carrying a 129-lb. mass on his back. $180 + 30 + 129 + 21 = 2 \times 180$. If his legs can exert the same force at a higher velocity, unencumbered, he could jump $25\frac{1}{2}$ ft. Of course, muscles are nonlinear in their action, but I conjecture that this assumption of constant force, in this range, will not be far wrong.

As to your question about running, I don't care to try to calculate it, but I can guess. Running speed is limited by air resistance, inertia of the legs, and weight. Find out how fast a man can kick backward, and you have the upper limit. I conjecture that his actual speed will not be a great deal less than this. Of the three limiting factors, the inertia was included in the kicking measurement, the weight factor practically disappears (the limit will certainly be far less than $20 \times 6 = 120$ m.p.h.!) and the air resistance will be less. (Less, that is, if those writers who always describe spaceships, spacesuits, and Moon colonies as having 14 p.s.i. air pressure will consult some biologists. They will find that oxygen at 3 p.s.i. is equally good for breathing. Of course, cigarettes would have to be differently formulated so they wouldn't go up in flames, but such considerations would be minor, I think, compared to the saving in structural material no longer needed to resist all that extra useless

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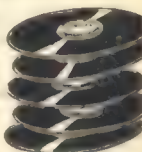


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pressure). My guess is about 40 m.p.h. At normal pressure, I would expect him to go about as fast as a man can skate or bicycle—about 30 m.p.h.—Richard V. Eck, Riverdale, Maryland.

One more factor, please! Muscles are protoplasm—and they have viscosity. That, more than anything else, limits Man's speed.

Dear Mr. Campbell:

On the chance that you have not read "Genetics," by Hans Kalmus (Penguin Books, Harmondsworth, Middlesex) I pass along a few quotations from it because they seem to bring out a few problems science-fictioneers have neglected in the stories I've read:

The "Earth colony on another planet" story is, of course, a standard type. Generally this colony exists many generations before recolonizing Earth, progressing to other star systems, et cetera. I've read about such colonies being destroyed by an impressive variety of external enemies, as well as ingenious types of internal (sociological) dissension, but surest of all would perhaps be the harmful recessive genes present in a heterozygous population lately become well-traveled on its own planet, but isolated in its new home. Says Mr. Kalmus (p. 128):

"Genetical diversity is clearly dependent on the size of the population.

The smallest unit is the mating group, which may be part of a larger population . . . or identical with an isolated population . . . Recessive genes in such (isolated) groups become more frequently manifest than elsewhere . . . At the same time the deleterious genes are slightly less frequent in the groups mentioned than in the general population, because, as they occur more frequently in the homozygous state, they are also more frequently eliminated (by natural selection) . . .

"At the present time inbreeding is decreasing and outbreeding increasing, and the consequence of this will be that harmful recessives will spread throughout humanity; but the incidence of the inborn diseases due to these factors will diminish as long as this expansion of the mating system continues . . . Should humanity for any reason be broken up into smaller mating communities, the spreading of these recessives would at once become manifest in a marked increase of the incidence of inborn diseases. However, as such a development is very unlikely, and would in any case mean the end of our civilization (!), genetical considerations in such circumstances would probably not be important."

In all fairness, a person with a family predilection for hemophilia would probably not be allowed to ship out for colonizing. One could hardly refuse an Irish-American, however, even if his ancestors on both sides came from isolated hamlets noted for an

occasional homozygous sample with negative survival value. Travel has increased the size of the mating group tremendously in the last sixty years, but that's still only two generations.

Of course, the identical argument can be used to support the desirability of a heterozygous population for colonization: The possibility of a colonist homozygous for a survival characteristic peculiar to the new planet is much greater than with a genetically homozygous population, which would change only as a consequence of current mutation.

My point is simply that there would be a problem present in any "Galactic Empire" colonization covering many generations. Although there has been an occasional story revolving around eugenics, my position on that is identical with Mr. Kalmus':

(After pointing out that elimination of a homozygote would still leave hundreds of heterozygotes to spread the gene) "Even less can be said for positive eugenics. Even if it were desirable to produce more geniuses, whatever that may mean, there is no recipe for their production at present. Peculiar qualities which make for human greatness are probably due to the mixture of many genes and develop only in particular circumstances, which may be called congenial, but are at present impossible to define."

Incidentally, in certain "Golden Ages" immediately following an ad-



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vance in travel method which opened up isolated territories, heterosis or F₁ hybrid vigor may have had something to do with "human greatness." Or so say I.—Howard Bodger, 1713 Illinois Street, Whittier, California.

And on top of that, we'd have the fact that a new planet would make useful some characteristics that, on Earth, might have been harmful! On a high-gravity world, dwarfs would prosper!

Dear John:

Your "The Villains Of The Piece" was very good. As you point out, a lot of writers misuse statistics to put over their pet ideas—and quite often they do so knowingly and intentionally. I don't like that. For example, I read recently that Nevada is almost certain death for consumptives. Statistics showed that more people, for the population, died of TB in Nevada than any other state. The writer failed to mention how many TB deaths were of people who had brought the TB with them, from other states.

And, of course, statistics prove that the most dangerous thing a person can do is to lie down on a bed. More people die in bed than anywhere.

On the other hand, it is not at all dangerous to do a hand-stand on top of a lighthouse during a hurricane. Statistics would be almost certain to show that nobody was ever killed or injured while doing a hand-stand on a lighthouse during a hurricane.

How about some screw-ball form of government that decided to be very logical and methodical and let all governmental operations and decrees be in obedience to statistic data?

. . . Statistics Clerk, Smith, held the sheet of statistical data close to his face and peered painfully at—A recent survey had shown that people who wore glasses had poorer eyesight than people who did not wear glasses, so the government had forbidden spectacle manufacturers to waste any more labor and materials in the construction of harmful spectacles. Smith tried unsuccessfully to read the fine print, wished briefly and traitorously that he had his glasses once more, then looked up at the sound of a crash outside.

It was, he saw, two of the City Transit System buses. They had been running into each other and buildings all morning for some reason. He shook his head, wishing the burning sensation in his stomach would go away. Once he had taken bicarbonate of soda for his chronic heartburn, but a survey had shown that habitual users of soda were invariably victims of chronic gastric acidity, whereas people who never used soda were never bothered with heartburn.

But the buses that had been colliding all morning—it was very strange. A recent survey had shown that trained drivers had far more accidents while driving than Australian Bushmen who had never seen a bus. So,

the government had used the valuable data to replace the dangerous trained drivers with the Bushmen who had never had an accident. It was very strange that the buses were colliding for more often than ever.

I guess there's no doubt about it—there are conceivable forms of government far more inefficient than ours.—Tom Godwin.

Well, it sounds logical, doesn't it?

Dear Mr. Campbell:

I would like to point out a slight error in the story "Thou Good and Faithful" in the March issue of ASF.

The expedition doctor states that he cannot find *any* bacteria, virus or sub-virus in the air, *soil* or the vegetation.

The error is that bacteria take a definite part in the well-being of plants. Bacteria in the soil are needed to break down complex organic com-

pounds into ammonia, water and carbon dioxide, which are simple end compounds. Other bacteria synthesize the ammonia into nitrites and nitrates. Then the plants use these nitrates which are in simple form.

Of course the plants could use the simple form of nitrates which are found in chemical fertilizers; I assume the robots did not spread a complete fertilizer.

Bacteria would also be needed to carry out the decay of the dead leaves from the plants; that is, the leaves that would normally fall off the plants during their growth. Otherwise, the great amount of fallen, undecayed leaves would soon choke out the plants.

Except for the above error, the issue as a whole was very good.—Frank Matanzo, 1109 Portland Avenue, Orlando, Florida.

The criticism is valid!

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of releasing nuclear energies simple enough for home or amateur use. The cultural value of that information would approach negative infinity—i.e., it would annihilate the culture under present conditions. It would permit any moderately intelligent psychotic paranoid to commit suicide in such manner as to *really* make the world be sorry they had been so cruel to him.

This culture does not have sociopsychological data sufficiently well related to be able to spot such psychotics. Under the existing conditions, therefore, the proposed increase in physical science data would constitute an infinite-negative cultural value—pure noise.

The humanic sciences have not solved their assigned area of the problem; the immense amount of data already accumulated must contain all the necessary key data to make a far greater attack on the problem than has ever been achieved. It seems highly probable that what is now needed is *not* more data—the mass of data already is in the added-noise region!—but more relationship. When a dozen different and nonrelatable theories of psychology can exist, then psychology lacks relationship, not data. When a science can't predict accurately, it needs more relationship, or more data. Unfortunately, it's far easier to find and demonstrate data than to find and demonstrate relation-

ship; it takes far higher courage to propose a relationship than to state an observation.

A third field that exemplifies the problem beautifully is that of the ESP or "psionic" phenomena. Dr. Rhine, of Duke University, is best known for his efforts to reduce the heterogeneous data of the "mystics" into something that made coherent sense—to catalogue the phenomena understandably, in other words.

The situation could be described in this way: there are phenomena of Class P which have been observed and reported. Class P cannot be related by any known relationship system to phenomena in the well-catalogued Class S. To force Class P data into Class S under these conditions would *not* increase the usefulness of Class P data, and would diminish the usefulness of Class S data.

In other words, it would not be wise or sane for the physical scientists, who have a well-operating system, to intrude the psionic data in their work; the psionic data is valueless until relationships can be established, and would only serve to render less useful the science data on hand.

Instance: Accept for a moment that the human will alone can influence the behavior of physical matter. Then if that is made part of the accepted background of physical science—but without the relationship information of how much, under what conditions, et cetera, we have a hopeless befuddle-

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ment. Dr. John Jones reports that mixing hoosenany hexaflooside with phromaluff bromate yielded eighty per cent wadgamacallut bromide. When Dr. Richard Roe repeats the experiment and reports "No yield is produced," Dr. Jones merely writes in "Of course there was no yield; it is well known that Dr. Roe doesn't believe in that reaction, and it is evident that he used his psionic matter control powers to vitiate the experiment. My original report was perfectly correct; Dr. Roe is no gentleman to suggest that the positive report I published was due to inaccurate analysis and sloppy technique on my part."

Physical science could be, and would be, neatly rendered pure noise if the psionic powers were accepted for consideration *without detailed relationship and understanding*.

The fact that the physical sciences have advanced more in less time than

any other field of human thought strongly suggests that the methods of thinking applied in that field are the best men have developed so far; they have worked well. This does not mean they're perfect.

If the psionic data is to be made useful, then, it would behoove someone to study and truly understand the methods of thinking used by the physical scientists, and use the methods of thinking in analyzing psionic data.

However . . . a powerful mind, given the training of the powerful physical-science methodology, can readily achieve great and real satisfactions in the field of physical science. Results for such a powerful and trained mind would be rapid and sound.

On the other hand, there is no visible evidence that application of the abilities of such a competent mind to

the psionic field would yield any reward whatever—either in personal satisfaction or achievement or financially.

The unfortunate result is that because the field hasn't already been developed, it is not being developed.

No sane entity will work without prospect of reward of some kind. Since most people in our culture can see only negative reward in considering psionic factors—and as pointed out above, the rewards would be negative; it would introduce pure noise into a functioning system—it properly appears to most people that consideration of psionic functions is insane. Therefore the common feeling "All mystics are crackpots."

Science fiction is a unique medium, however. That psionic phenomena do exist has been proven many, many times; they can't be considered in normal channels of work because of the noise effect indicated. However, they *can* be considered in the fiction-entertainment field, because within that special area, the rewards *are* positive.

If you saw a man deliberately build a complex and delicate machine, spending thousands of dollars on it, and, immediately after completing it he demolished it with equal deliberation—there would be three possible explanations:

1. He is insane.
2. He's engaged in research, and testing the model to destruction.

3. He's working for the movies.

The psionic phenomena represent the very curious situation that they can *not* be studied as part of normal research programs. Positive results would yield a sudden high noise level in the highly important physical science work!

But the phenomena *can* be studied for "the movies"—i.e., for entertainment purposes, whether personal, for stage, or in stories.

Science fiction represents the peculiar field wherein the highly competent minds of men highly trained in the use of the powerful thinking techniques of science can entertain themselves and others. In this field, speculation about psionics has purely positive values!

But it remains very powerfully true that data which is *not* related is many times of negative, not positive value. Sheer accumulation of data is not merely a waste of time—it's destructive.

On a purely physical basis, the Collier brothers who, some years back, smothered to death in the insane mass of trivia they had accumulated over the years, represent a very real cultural danger: you can smother in unrelated facts.

The constant search for more facts can be ultimately stultifying; the search for more relationships is much more difficult, but that alone can make the accumulation of facts useful.

THE EDITOR.



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